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THE LONDON NATURALIST

Journal of the
LONDON NATURAL HISTORY SOCIETY

No. 79 2000

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LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its recording area (the London Area) lies within a 20-mile (32-km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises Sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology, or rambling, there is a Section ready to help.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area and beyond, including records of plants and animals.

The *London Bird Report,* also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin,* are sent to members throughout the year.

Indoor meetings

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

Field meetings

Led by experts to visit interesting localities, both within and outside our Area. These excursions are very popular with beginners wishing to increase their knowledge, and enable members to get to know one another.

Library

A large selection of books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

Reading circles

Many important natural history journals are circulated by the Sections at a fraction of the cost of subscribing direct.

SUBSCRIPTIONS

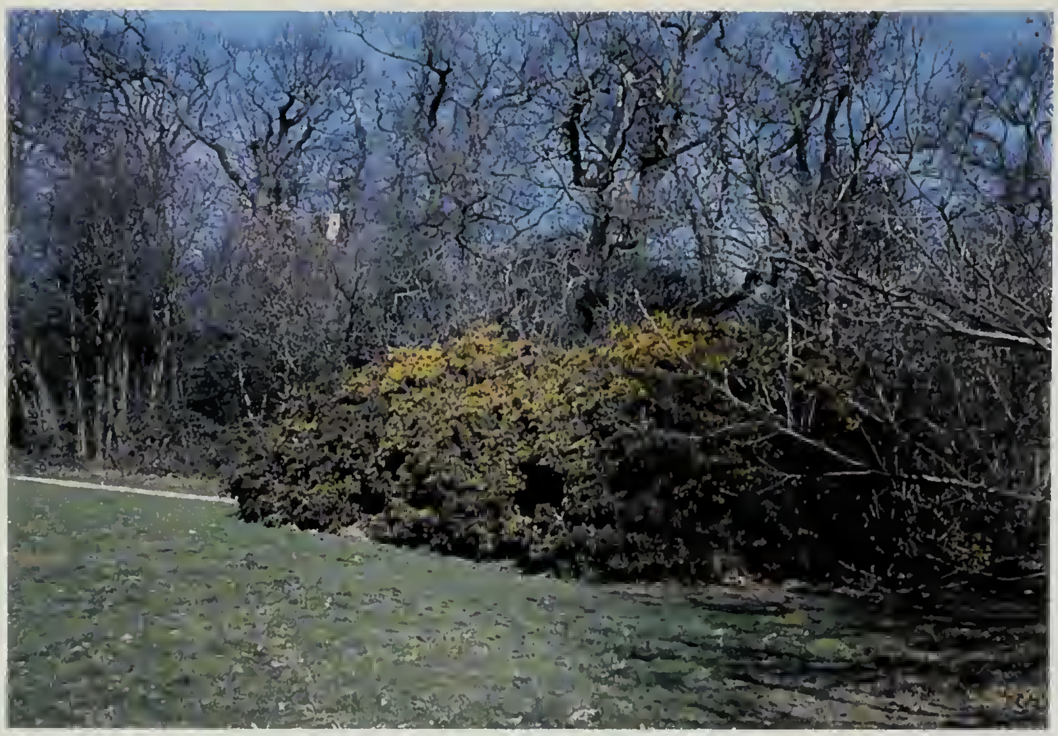
ORDINARY MEMBERS	£15.00
JUNIOR MEMBERS	£5.00
SENIOR MEMBERS	£8.00
FAMILY MEMBERS	£3.00
CORPORATE SUBSCRIBERS	£15.00

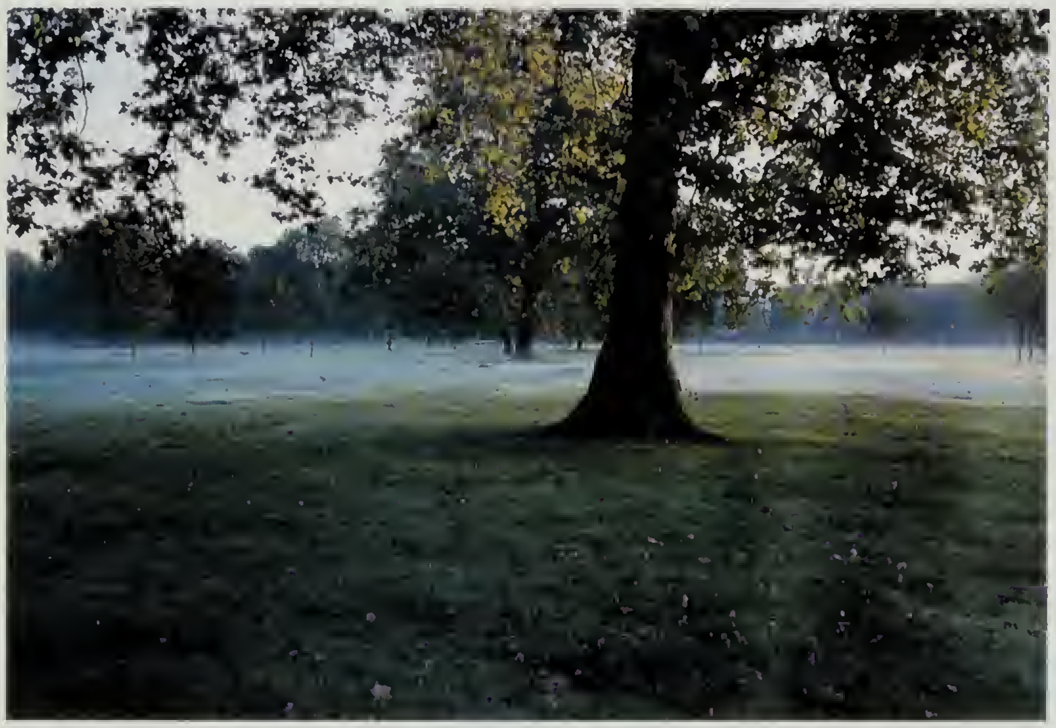
Junior membership is for persons under 18, or under 25 and receiving full-time education, and senior membership is for persons over 65 who have been continuous members of the Society for ten complete years. All except family members receive one free copy of *The London Naturalist* and the *London Bird Report* each year. Cheques and postal orders, payable to the London Natural History Society, should be addressed to:

The Membership Secretary, LNHS,
Ruth Day, 18 Zenoria Street,
London SE22 8HP

THE LONDON NATURALIST

Further copies of this issue of *The London Naturalist* may be obtained (price £6 plus £1 postage and packing in the UK and the Republic of Ireland) from Catherine Schmitt, 4 Falkland Avenue, London N3 1QR. Back numbers of most recent issues of both *The London Naturalist* and *London Bird Report* are also available from the same address. Cheques should be made payable to the London Natural History Society.





Typical London grassland and scrub habitats.

Top: The northern edge of South Meadow, Hampstead Heath. Mown grassland and gorse bushes, planted about twenty years ago. Gorse potentially provides a relatively rich scrub habitat for spiders, although the spider diversity is much greater in older patches which only occur in one or two places on the Heath.

Bottom: Frost on regularly mown short grass in Hyde Park, including some areas which retain traces of the flora and some spiders from ancient unimproved grassland.

Photos: J. E. D. Milner

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THE LONDON NATURALIST

Journal of the LONDON NATURAL HISTORY SOCIETY

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for the year 1999

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LONDON NATURAL HISTORY SOCIETY

Founded 1858

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R. S. R. FITTER, FLS, FZS, MBOU
Drifts, Chinnor Hill, Oxford OX9 4BS

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Treasurer: M. J. West, 52 Trinity Road, Ware, Hertfordshire SG12 7DD.

Membership Secretary: Ms R. Day, 18 Zenoria Street, London SE22 8HP.

Librarian: Mrs L. Hewitt, 106 Hatherley Court, London W2 5RF.

Editor, *The London Naturalist:* K. H. Hyatt, 1 Tremcelynog, Rhandirmwyn, Llandovery, Carmarthenshire SA20 0NU.

Co-ordinating Editor, *London Bird Report:* Ms R. Day, 18 Zenoria Street, London SE22 8HP.

Editor, *Newsletter:* Ms M. L. Medina, 36 Meadow Road, Shortlands, Bromley, Kent BR2 0DX.

Editor, *Ornithological Bulletin:* N. Tanner, 11 Collins House, Newby Place, London E14 0AX.

Elected Members of Council: N. Anderson, R. A. Blades, Miss V. S. Harley, Dr J. F. Hewlett, A. J. Leppard, Miss F. J. Turtle.

Representative Members of Council: BOOKHAM COMMON SURVEY — Dr I. S. Menzies; BOTANY — Dr M. C. Sheahan; ECOLOGY AND ENTOMOLOGY — Mrs C. M. Schmitt; HAMPSTEAD HEATH SURVEY — Dr C. Bowlt; ORNITHOLOGY — Miss N. A. Duckworth.

† Deceased February 2000.

The Society's Recorders

Botany

Flowering plants and vascular cryptogams: R. M. Burton, MA, FLS, Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent DA4 0JJ (01322 863216).

Lichens: Ms A. J. H. Waterfield, B.SC., 29 Gloucester Crescent, London NW1 7DL (020-7267 8060).

Ecology and Entomology

Mammals: C. Herbert, 67a Ridgeway Avenue, East Barnet, Hertfordshire EN4 8TL (020-8440 6314).

Reptiles and amphibians: T. E. S. Langton, B.SC., 12 Millfield Lane, London N6 6RA (01986 784518).

Fishes: Dr Ruth Kirk, Crucian, PO Box 1051, Kingston on Thames, Surrey KT2 5WX (020-8401 6766).

Arachnida: J. E. D. Milner, B.SC., 80 Weston Park, London N8 9TB (020-8341 2158).

Coleoptera (Carabidae and Coccinellidae): P. R. Mabbott, B.SC., 49 Endowood Road, Sheffield S7 2LY (0114-201 4504).

Coleoptera (Lucanidae and Buprestidae): Dr D. S. Hackett, FRES, 3 Bryanstone Road, London N8 8TN (020-8292 6134).

Coleoptera (families not otherwise listed): M. Barclay, 47 Tynemouth Street, London SW6 2QS (020-7371 9095).

Lepidoptera (butterflies): L. R. Williams, 34 Christchurch Avenue, Kenton, Harrow, Middlesex HA3 8NJ.

Lepidoptera (moths), Syrphidae, and invertebrates not otherwise listed): C. W. Plant, B.SC., FRES, 14 West Road, Bishops Stortford, Hertfordshire CM23 3QP (01279 507697).

Orthoptera: Miss S. L. Bain, 232 Brecknock Road, London N19 5BQ (020-7609 0430).

Hymenoptera Aculeata: R. W. J. Uffen, 4 Mardley Avenue, Welwyn, Hertfordshire AL6 0UD (01438 714968).

Heteroptera: E. W. Groves, 143 Westleigh Avenue, Coulsdon, Surrey CR5 3AF.

Odonata: Ms Ruth Day, B.SC., 18 Zenoria Street, London SE22 8HP (020-8693 4259).

Plant galls. Isopoda and Myriapoda: K. Hill, BA, FLS, 93 Elmhurst Drive, Hornchurch, Essex RM11 1NZ (01708 456652).

Mollusca: Vacant.

Records may be sent to the appropriate recorder (where shown) or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Geology

c/o R. E. Butler, B.SC., FGS, 205 Barnett Wood Lane, Ashtead, Surrey KT21 2DF (01372 274103).

Ornithology

Inner London: D. McKenzie, 26 Cuthbert House, Hall Place, London W2 1LT.

Hertfordshire: A. D. D. Wilson, 14 Marina Gardens, Cheshunt, Hertfordshire EN8 9QY.

Buckinghamshire: A. V. Moon, 46 Highfield Way, Rickmansworth, Hertfordshire WD3 2PR.

Kent and Lower Thames (London Bridge to Tilbury): A. J. Morris, 134 Station Road, Crayford, Kent DA1 3QQ.

Surrey and Upper Thames (Wandsworth to Staines): S. J. Spooner, 32 Berkeley Drive, West Molesey, Surrey KT8 1RA.

Middlesex: C. Lamsdell, 4 Hardings Close, Iver Heath, Buckinghamshire SL0 0HL.

Essex: D. G. Lambert, 109 Gloucester Road, London E17 6AF.

Requests for information should be made to the appropriate recorder.

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Report of Council for the year ending 30 June 1999

Approved at the Annual General Meeting on 6 December 1999

Your Council was delighted that in December 1998 Richard Fitter agreed to become our President. Richard is a most distinguished naturalist and the Society was honoured by his acceptance of office. It was therefore with even greater pleasure we noted that he has been awarded the Christopher Cadbury Medal for 'Services for the advancement of nature conservation'.

The past twelve months have been of steady activity for the Society. The Council through its various committees has continued and will continue to consider what changes need to be made in order to streamline our internal organization. It is also actively considering changes to our constitution to make relations easier between ourselves and other bodies, particularly those like-minded societies and providers of open spaces where many of our recording and observation studies are undertaken. The problem of a lack of volunteers to help with administration remains — some posts have been filled but many offices remain vacant or are being held by members who feel that they would like to move on to other things but are unable to find successors.

Membership

Peter Holland resigned from the post of Membership Secretary as at 30 June 1999 after some twenty years in the job. The debt the Society owes him is incalculable.

We have to record the deaths of P. W. E. Currie, H. J. Freeman, R. J. Green, K. G. Harris, G. C. D. James, D. B. Rolleston, Mrs I. H. Robinson and Mrs H. S. Stebbing.

Total membership of the Society is 1,215 as follows:

Ordinary	921	Junior	11	Honorary	24
Family	98	Senior	128	Life	5

Organizations affiliated to the Society 28.

During the year Council has appointed the following to be Honorary Members of the Society:

Miss M. L. Campbell
A. Gibbs
G. C. Gore
P. Tate
Miss P. J. Wortley

Conservation

The Society has been a member of the London Biodiversity Partnership from the outset and also contributes to the biodiversity partnerships which now exist in many of the individual London boroughs. These partnerships have led to a closer working relationship with English Nature, the Royal Society for the Protection of Birds, the London Wildlife Trust and the London Ecology Unit, all of which have been supplied with data from the Society's records. Together with these and other scientific and nature conservation organizations, the Society opposed the development on the Inner Thames marshes at Rainham and supported a bid by the RSPB to buy Ministry of Defence land at Wennington and Aveley and turn it into a nature reserve. The Society also supported Nonsuch Watch in urging that wildlife habitats be conserved at Cherry Orchard Farm.

The Society is a member of the London Wastelands Forum, a group which aims to champion the importance of London 'wastelands' for both people and nature conservation. 'Wastelands' form some of the best nature conservation areas in London, a fact which might otherwise be overlooked with the present emphasis by government on building on 'brownfield sites'.

The Nature Conservation Working Group also continued the resurvey of the Beverley Brook in south-west London.

Study Centres

Continuing studies of the natural history of Bookham Common have been well supported by an excellent turnout of members. Average attendance over the full year has been about twelve per Bookham Saturday, but up to thirty have attended during the summer. It would of course be a delight to welcome more, whether experts or beginners. Rainfall adversely affected much of the field work during 1998, and was largely responsible for the absence of dragonfly and mammal reports. The pond-life field day led by Eric Groves was a notable exception. The effect of this very wet period on various aspects of Bookham Common natural history following many years of low rainfall will be a matter of great interest.

Grazing by cattle has now been implemented on the whole of Central, Bayfield and Isle of Wight Plains to help control scrub; the area has been most professionally fenced. Scrub clearance and tree thinning have also continued, but with care to retain sufficient blackthorn scrub for the nightingales which are doing particularly well at Bookham.

A major new botanical survey has been commenced in 1999, following similar undertakings in 1953 and 1977. It is anticipated that subsequent analysis of the three surveys will provide valuable information.

The Hampstead Heath Survey continues well with the working Sundays being particularly well supported. Apart from routine monitoring, which continues to produce surprises, several special projects have been completed, the results of which will in some cases be published in *The London Naturalist*.

Library

The library has continued to flourish and to be well used in its new setting.

Two hundred books and some videos and CDs have be added to stock and many gaps in runs of journals have been filled. The library received a generous bequest from David Thompson.

Revision and consolidation of both book and journal holdings continued, guided by recommendations and suggestions from the Sections. Older and less relevant items are being replaced on the shelves by up-to-date more local material which will be useful to members in their research. In common with most sections of the Society's administration 'staff time' is a major problem and much remains to be done.

Mrs Czigány and the staff of Imperial College Central Libraries have been most helpful and the Society thanks them very warmly.

Archives

A small amount of new material was added during the year. There was no change in the curation level, but the archives continue to be held securely in the basement of Imperial College library. Much of the early records of the Society and its precursors, dating back to the Haggerston Entomological Society nearly 150 years ago, have been loaned to Alwyne Wheeler who has started research towards writing a history of the Society.

Publications

The latest editions of *The London Naturalist* and *London Bird Report* were well received. Our thanks must go to both Keith Hyatt and Andrew Moon, the editors of the journals. Andrew has now stepped down but Ruth Day has agreed to co-ordinate a team to produce the *LBR* for 1998 — publication is expected in February 2000.

The results of the survey of the gardens at Buckingham Palace are to be published in supplements to *The London Naturalist*. Colin Plant is co-ordinating this work. The first supplement should be issued in December 1999.

The Society has continued its practice of donating copies of its books to libraries, universities, etc.

Production of the *Atlas of breeding birds* is still encountering difficulties but it is intended that some data will be made available during 1999.

Other matters

As always your Council is grateful to all officers and helpers without whom the Society would not flourish. More volunteers are required but the Society goes forward into the twenty-first century in excellent shape both as regards its activities and its finances.

Treasurer's report for 1998/9

At the end of the financial year on 30 June 1999, the total net assets of the Society were £489,532, compared with £479,549 the previous year, representing an increase of around two per cent.

Incoming resources for the year, at £38,128, were almost identical to the 1997/8 figure. Subscription income (net of tax recoverable on covenanted subscriptions) increased from £15,550 to £16,589, but donations fell from £877 to £686. Income from sales of the Society's various publications rose from £1,617 to £2,333, with a significant increase in revenue from current and back numbers of *The London Naturalist* and *London Bird Report*. Investment income fell by around eight per cent from £19,617 to £18,310 (net) reflecting economic conditions and a reduced rate of tax recoverable. However, the market value of the Society's portfolio of investments rose from £457,722 to £472,940.

Overall expenditure during the year was £45,846, compared with £46,767 in 1997/8, with most elements (including all management and administrative expenses) remaining at about the same level as the previous year.

The difference between incoming resources and expenditure was, this year, more than balanced by the profit from sales of investments, which have all been reinvested.

Year 2000 compliance

We are in the process of assessing the risks to the Society in detail. We are considering not only our own systems but also those of our suppliers. Once our assessment is complete we will develop detailed plans to deal with any such risks as are identified.

Statement of trustees' responsibilities

Charity law requires the Council as trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of its financial activities for that period. In preparing those financial statements the trustees are required:

- to select suitable accounting policies and then apply them consistently;
- to make judgements and estimates that are reasonable and prudent;
- to state whether applicable accounting standards have been followed subject to any material departures disclosed and explained in the financial statements; and
- to prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in business.

The trustees are responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the charity and to enable them to ensure that the financial statements comply with the Charities Act 1993. They are also responsible for safeguarding the assets of the charity and for taking reasonable steps for the prevention and detection of fraud or other irregularities.

Report of the auditors to the members of the London Natural History Society

We have audited the summary financial statements set out on page 10.

Respective responsibilities of trustees and auditors

The summary financial statements are the responsibility of the trustees. Our responsibility is to report to you our opinion on their preparation and consistency with the full financial statements and Annual Report.

Basis of opinion

We conducted our audit in accordance with Auditing Guideline, *The auditor's statement on the summary financial statement,* adopted by the Auditing Practices Board.

Opinion

In our opinion the summary financial statement is consistent with the full financial statements and Annual Report of the Society for the year ended 30 June 1999.

4 London Wall Buildings
LONDON EC2M 5NT
27 October 1999

FRASER RUSSELL
Chartered Accountants
and Registered Auditors

Summarized accounts for the year ended 30 June 1999

These summarized accounts have been extracted from the Society's annual accounts for 1998/9. They may not contain sufficient information to provide a full understanding of the financial affairs of the Society. For further information the full accounts, the auditors' report on these accounts and the trustees' annual report should be consulted. Copies can be obtained from the Hon. Treasurer, M.J. West, 52 Trinity Road, Ware, Herfordshire SG12 7DD.

The annual accounts were approved by the trustees on 27 October 1999.

Summarized statement of financial activities for the year ended 30 June 1999

	Unrestricted funds	
	1999	**1998**
	£	**£**
Incoming resources		
Subscriptions received from members	16,589	15,550
Interest receivable	210	311
Investment income	18.310	19,780
Publications/journals income	2.333	1,617
Other sundry income (including donations and bequests)	686	877
Total incoming resources	38,128	38,135
Resources expended		
Direct charitable expenditure	33,347	34,277
Management and administrative expenses	12,499	12,490
Total resources expended	45,846	46,767
Net (outgoing) resources for the year	(7,718)	(8,632)
Gains and losses on investments		
Realized gains on sale of investments	37,802	12,667
Unrealized (losses)/gains on revaluation of investments	(20,101)	38,702
Net movement in funds	9,983	42,737
Fund balance brought forward at 1 July 1999	479,549	436,812
Fund balance carried forward at 30 June 1999	£489,532	£479,549

Balance sheet as at 30 June 1999

	1999	**1998**
	£	**£**
Fixed assets		
Tangible fixed assets for use by charity	2,069	2,685
Investments at market value: listed	472,940	457,722
cash	11,048	20,297
	486,057	480,704
Net current assets/(liabilities)	3,475	(1,155)
Total net assets	£489,532	£479,549
Represented by:		
Unrestricted funds	£489,532	£479,549

Official and sectional reports for 1999

CONSERVATION

The Society has been a member of the London Biodiversity Partnership from the outset and also contributes to the partnerships which now exist in many of the individual London boroughs. These partnerships have led to a closer working relationship with English Nature, the Royal Society for the Protection of Birds, the London Wildlife Trust and the London Ecology Unit, all of which have been supplied with data from the Society's records. Together with these and other scientific and nature conservation organizations, the Society opposed the development of the Inner Thames marshes at Rainham and supported a bid by the RSPB to buy the Ministry of Defence land at Wennington and Aveley and turn it into a nature reserve. The RSPB held a one-day symposium on 26 March at Easbury Manor House, Barking for naturalists, ecologists and conservationists with an interest in the site and its future management. Several LNHS members attended and heard papers on mammals (including water voles), birds, amphibians and reptiles, aquatic and terrestrial invertebrates and plants. Then, having been brought up to date on recent research on the remarkable diversity of this near-London site, delegates went into workshops to recommend management strategies for the future nature reserve.

The Society continued to support Nonsuch Watch in urging that wildlife habitats be conserved at Cherry Orchard Farm in Ewell, Surrey.

Annie Chipchase drew attention in this journal to the ecological importance of 'wastelands' (Chipchase 1999). She also set up an informal discussion group — The Wastelands Forum — to devise ways and means of countering the threats to London's biodiversity posed by the possible development of what the government calls 'brownfield sites'. The forum met several times during the year and we hope that the London Wildlife Trust will soon publish a colourful and popular leaflet putting the case for keeping many of these sites undeveloped for their wildlife and amenity value. Several LNHS members have contributed photographs for possible inclusion. One meeting was held jointly with the Jackson Environmental Institute (London University), who were working on a pilot project in the Wandle valley 'development corridor' integrating many diverse datasets into a unified database and geographical information system resource. Their aim was to facilitate development of London's Brownfield Resource in accordance with government objectives while taking environmental, social and economic factors into account in line with objectives for sustainable development. Sadly, the considerable amount of LNHS data on the natural history of this area was not in a form in which we could make it available to the Institute.

The Nature Conservation Working Group continued the resurvey of the Beverley Brook in south-west London. (See Freda Turtle's paper on page 21 of this journal.)

In March, the Conservation Officer spoke on 'Conserving Nature in a London Borough' at the AGM of the Ecology and Conservation Studies Society. He also gave a brief account of some of the botanical consequences of London's 'heat island effect' as part of the BBC2 series 'The Essential Guide to the Weather' which was broadcast in September. On 25 November, the Joint Nature Conservation Committee first unveiled its new *Recorder 2000* computer program at a meeting at The Natural History Museum. This is expected to be available in June 2000.

Reference

CHIPCHASE, A. 1999. Ecological characteristics of the flora of urban derelict sites in London. *Lond. Nat.* **78**: 19–34.

DAVID BEVAN, *Conservation Officer,*
RUTH DAY, *Secretary, Nature Conservation Working Group*

BOTANY

The Section continues to organize a varied programme of talks and field outings. There have been three formal meetings: the first was on 4 February 1999, when Rodney Burton gave a talk on the flora of Norway; owing to a double booking at the Linnean this was given at the Royal Institution nearby in Albemarle Street. In March Irene Kettle spoke on the wild flowers of south-western Australia, and at the AGM in November Laura Ponsonby gave a talk on Marianne North. There were three formal meetings: the usual 'best botanical slides' evening in January, and two general identification sessions: one in July by Rodney Burton and one in September by David Bevan.

As usual the field trips have been varied and well attended, and are much enjoyed by the participants. We had visits to Burnham Beeches, Norbury Park and Mickleham, Harefield (a joint meeting with the Wild Flower Society), the Old Slade, Broxborne Woods, Therfield Heath, Shalford, Thorpe Hay Meadow, Croydon Airport (jointly with the Croydon Natural History and Scientific Society), the Grand Union Canal, Walthamstow Marsh, Gunnersbury Triangle, Coppetts Wood and the Glebelands LNR, Barn Elms Reservoir, Joydens Wood, the New Forest, Pevensey Levels, Ashdown Forest, Chobham Common (jointly with the London Wildlife Trust), Parliament Hill Fields and Hampstead Heath, Oxshott Heath, and the popular urban fungus foray in Haringey, another joint meeting with the London Wildlife Trust. In addition Carol and Bill Hawkins organized another informal field trip a bit further away than their last — this year a small intrepid group went to see the mountain flora of Glen Clova in Scotland. We thank everyone who has given talks and led meetings for us.

There were some changes to the officers and committee at the 1999 AGM: Pat Smith resigned from the post of Indoor Meetings Secretary and Rodney Burton, who was Chairman of the Section for an amazing thirty years (apart from a two-year gap in 1980–1982 while he was President of the Society), resigned as Chairman but agreed to take Pat's place as Indoor Meetings Secretary, so we shall not be losing him from the Committee. We owe Rodney an enormous debt of gratitude, and are also grateful to Pat for her hard work over the last five years. David Bevan was elected as our new Chairman. There is also a new member on the Committee: Paul Bartlett, who has already led many meetings for us.

DAVID BEVAN, *Chairman*, MARY CLARE SHEAHAN, *Secretary*

ECOLOGY AND ENTOMOLOGY

Once again the Section arranged a variety of indoor meetings of entomological and environmental interest by knowledgeable and interesting speakers. In January Edward Lindsay spoke on 'Peatlands — ecology and conservation' with special reference to the Flow Country. At February's informal meeting four members showed slides, beautifully photographed and with interesting commentary. Two meetings were held in March: the first was by Jon Riley on 'The rainforest of Cameroon' and the second was by Catherine Schmitt on the seventeenth-century naturalist, G. E. Rumphius. Charles Mackay of Customs and Excise spoke to us in June about CITES enforcement at Heathrow Airport. The Ecology and Entomology Section hosted the annual joint meeting with the British Entomological and Natural History Society in September this year when Ruth Day spoke on 'Dragonflies of the London area'. At the AGM in October, after reports from recorders of eight other taxa, Sandi Bain spoke on the Orthoptera to be found in the London area.

Five field trips were organized during the year. In May Dan Hackett led a group in Broxbourne Wood SSSI for a second year's search for tiger beetles. Two visits were made to Hampstead Heath, both in August, the first at the beginning of the month led by Ruth Day to observe dragonflies and the second three weeks later, led by Sandi Bain to study grasshoppers and crickets. In September Dan again led a group in Highgate Woods in search of invertebrates and to demonstrate techniques he is using in his survey of the area. In November a group met to visit the newly constructed exhibition area, 'The Web of Life' at London Zoo.

Paul Mabbott, Recorder of Carabidae (ground beetles) this year has instituted a millennium survey of ladybirds; members have been most co-operative, which is more than can be said of the ladybirds which have not been abundant this year; the survey will be extended into the year 2000. Records past and present are still sought. At the AGM Ray Uffen was elected Recorder of Hymenoptera. During the year the Section received with regret the resignation of Mollusca Recorder, Jane Reynolds.

Once again the Section represented the Society at the Amateur Entomologists' Society exhibition, selling maps, books and journals as well as making the work of the Society known to a wider public.

JOHN A. THOMPSON, *Chairman*, CATHERINE SCHMITT, *Secretary*

ORNITHOLOGY

The Section continued to organize a varied programme of lectures and field meetings. Once again the field meetings programme was a full one, with an outing almost every weekend. As previously most trips were to local sites and many thanks are due to those who made this possible by continuing to share their expertise, time and local knowledge to help members get the most from London's varied but lesser-known locations. In addition there were regular, and very well attended, coach trips to a range of excellent locations for bird life beyond the immediate London area. The summer trip to Minsmere, for example, continued to prove very popular and productive in terms of the range of birds and habitats at this Suffolk reserve. Thanks go to Neil Anderson for leading these coach trips, as well as for organizing and coordinating the full field trips programme.

Thanks are also due to David Montier for organizing his last full lecture programme, and for all his hard work over previous years as Indoor Meetings Secretary. Once again the lecture programme ranged over a variety of subjects relevant to ornithology and to London, from town-nesting gulls to the publishing of bird books. Unfortunately by the end of the year no one had stepped forward to take over as Indoor Meetings Secretary, jeopardizing continued provision of such interesting topics to members.

It was also a challenging year for those who came forward to take on the editing of the *London Bird Report* for 1998. Producing this major publication of the Society placed great demands on all the volunteers involved, under the able coordination of Ruth Day, and unfortunately the many complexities involved delayed publication of the report. Special credit is overdue for the vast amount of work done by the recorders and those who prepare the species accounts which form the bulk of the report. A further disappointment was that another year passed without publication of the long-awaited *New atlas of breeding birds of the London Area,* although progress was made in moving this project forward. On a more positive note the two-monthly *Ornithological Bulletin* continued to provide a range of interesting bird records from in and around London, thanks to records submitted by a large number of observers and the editorship of David Montier.

Members' participation in the Breeding Bird Survey continued to expand under Derek Coleman's organization. Another research project, especially appropriate for Londoners, house sparrow monitoring, was carried forward by Helen Baker with interesting results. The Research Committee, which co-ordinates the various projects, continued to benefit from the experienced guidance of its chairman Mike Dennis.

Thanks are due to all the officers, committee members, leaders and recorders who contributed to the Section's varied programme, its projects and its smooth running in 1999.

RON KETTLE, *Chairman*, NICOLA DUCKWORTH, *General Secretary*

Conference report

The Thames Revisited
(changes in its natural history in the past 25 years)

The Linnean Society of London and the London Natural History Society joint conference held at The Linnean Society, Burlington House, Piccadilly on Saturday 14 October 2000

There is so much going on about what to do for wildlife and the environment, not least in connection with the Thames (witness the Management Guidance for the Thames Estuary, the Thames Tideway Local Environment Agency Action Plan, the London Biodiversity Action Plan, and there seem to be others) that it is a pleasurable relief to hear about the wildlife itself. That we did at the above conference at the Linnean which was organized by our Society. The theme was to view the changes in the wildlife that have occurred since the LNHS last had a conference about the Thames twenty-five years ago. These have been influenced principally by the continuing improvement in the Thames water quality and the rebuilding and changes of use of the river's banks.

Steve Colclough (Environment Agency), dealt with 'Fisheries developments over the last 25 years'.

Nick Bertrand (LNHS), spoke on the 'Flora of the tidal Thames in inner London: past, present and future'.

Wyn Wheeler (LNHS and Linnean Society), gave us the 'History of the Thames Salmon Trust'.

Mike Dennis (LHNS), dealt with 'Birds of the inner Thames — an avian highway'.

Ian Tittley (Natural History Museum), considered the 'Changes in the marine algal vegetation of the tidal Thames'.

Sarah White (Environment Agency), had as her title 'Riverside apartments — last few remaining. Invertebrates in and around the Thames'.

Most of the emphasis was on the river downstream of Tower Bridge which left me wondering if our Society shouldn't be doing rather more systematic recording in, on, and beside the Thames in central London. In 1957 the London Thames was effectively dead with no resident fish between Kew and Gravesend. The situation now is quite different. The lower Thames and estuary now supports 116 species of fish. It is a prime breeding ground for certain species, including the shad. A number of species are passing through central London, such as young flounders which make cunning use of the tide to travel from the estuary to feed in the river way above London. Salmon have been assisted to return to breed in the Thames, but it was suggested that increase in water temperature due to global warming may ultimately defeat this.

The Thames-side flora has apparently not been properly assessed, and is more important than has been assumed in recent reports. There are a stated 350 invertebrate species associated with the lower Thames and many of these help to feed the estimated 15,000 wildfowl and waders which overwinter here. Both the invertebrates and the flora can be assisted by various schemes that are being developed by the Environment Agency for dealing with the built-up banks. Ian Tittley reviewed how algae (mainly seaweeds) have also benefited from the cleaner water and are continuing to spread upstream. We were delighted to have him at the conference since his talk was a continuation of the one he gave at the previous conference twenty-five years ago. This was published in *The London Naturalist* No. 56, 1977. We hope that his and the other speakers' talks at the 2000 conference will also soon be published.

Colin Bowlt

The London Natural History Society in the 1930s and 1940s

RICHARD FITTER
Drifts, Chinnor Hill, Chinnor, Oxfordshire OX9 4BS

Presidential Address delivered at the Annual General Meeting on 6 December 1999

I am glad to have this opportunity of saying how delighted I am that you have done me the honour of choosing me as your President. In case any of you are wondering why the Society should have chosen someone who has for the past forty-six years been living in Oxfordshire, I hasten to reassure you that I am not only a long-time member and former officer of the Society, but was actually born in London. Indeed I have often speculated on whether, on a very quiet night with a northerly wind, the sound of Bow Bells might not be faintly heard in Mount Nod Road, Streatham, where I first saw the light of day on 1 March 1913. After that event I lived for all but four of the next thirty-three years within the Society's area, first at Hatch End, Middlesex, then, after four years on the Sussex coast, successively at Wallington and Ewell in Surrey, and Bloomsbury and Highgate in London.

It was at Hatch End, aged about five or six, that I became fated to be a naturalist. Somebody showed me a song thrush's nest with those wonderful blue eggs speckled with black. At about the same time I remember being shown a small brown bird climbing about an oak tree that I realized long afterwards must have been a wryneck, which bred in Middlesex in those days — a pair nested at nearby Harrow as late as 1927. Another memory from the early 1920s is of a magnificent bluebell wood close to Harrow Weald Common, ringing with a plaintive song. Many years later I realized that that was my first experience of willow warblers — have any of you heard a wood anywhere ringing with willow warbler song in recent years? Soon after this I came across a copse filled with ramsons that has long since gone under bricks and mortar. Another copse, just across the Hertfordshire border, had lesser periwinkle, which I believe may still survive and even be native, as it is one of the plants that Clement and Foster accept, with reservations, as native. Certainly it was not in those days close to any garden.

That all led on, as was common at that time, to my starting to collect both birds' eggs — only taking one egg from each nest, of course — and butterflies and moths. My first written natural history note was triggered by the sight of my first dark green fritillary on the South Downs in August 1923, which led me to keep data with my collections. My first bird note not linked to an egg was on the Sussex coast in February 1928. You would be surprised at the number of full card-index boxes that has led to.

It must have been in 1928 too that my headmaster at Eastbourne College detailed me to be secretary of the College natural history society. That also was the first step in a long story. The headmaster incidentally was E. C. Arnold, one of those old-fashioned ornithologists who used to prowl about the north Norfolk coast with a walking-stick gun. His school nickname was Og, so that the wood near Polegate which he gave to the College as a nature reserve was known as Og's Wood. He once quipped that historians of the twenty-first century would assume that Og had been a minor Saxon chieftain.

I left school in 1929 and for the next few years was probably the only naturalist at the London School of Economics, a peculiarly unsuitable place to enjoy wildlife. It didn't even have starlings roosting on it. Indeed the most interesting object I ever saw flying over it was the R100 airship in October 1929.

Then about 1932 I joined and spent a couple of years with the Croydon Natural History Society, under the leadership of C. C. Fagg. Only last May that society invited me, in my capacity as your President, to open a photographic exhibition in Croydon.

However, in 1934 I heard of, and soon joined, the LNHS and my fate was finally sealed. In those days we met in Bloomsbury, in the London School of Hygiene and Tropical Medicine, and one of my earliest memories is of a meeting of the Ornithological Section addressed by Percy Bunyard on the breeding habits of the cuckoo, which he believed to deposit its eggs in its host's nest with its bill, having laid them elsewhere. At the back of the room sat The Reverend F. C. R. Jourdain, a co-author of the original *Handbook,* who growled that he had come to see how gullible the Society's members were.

In the late 1930s we had field meetings which, just as today, were mainly within the Society's 20-mile radius, but we made fairly regular visits to select places within 30–40 miles, such as Tring Reservoirs, the Blackwater Estuary and the North Kent Marshes at High Halstow. One of my early memories is of Dick Homes urging me to attend a field meeting at Tring, where last time they went they had seen a greenshank, a bird which at that time I had never seen.

My present records tell me that I have visited Tring Reservoirs, in that curiously phallic bit of Hertfordshire that pushes into the Vale of Aylesbury north of Tring town, an average of four and a half times a year since January 1935, when a friend took me there during an outing we had when his father allowed him to borrow the family car. On that visit I saw nothing more exciting than a teal, though in fact the teal is not one of the ducks I expect to see there on my periodic visits in the 1990s. However, I suppose Tring must be the place where I have birded most often in my life, and though I more often than not come back complaining that I have seen nothing more interesting than a Canada goose, I have often enough had splendid birdwatching experiences there.

There was the famous day in June 1938, for instance, when Dick Homes and I had gone down expressly to see the first breeding little ringed plovers in Britain. We walked along the towpath from the station, and as we came down the causeway between Marsworth and Startopsend Reservoirs, we were met by a slightly agitated Helen Rait Kerr, who was wardening the site, on a dried-up part of the bed of Startopsend, on behalf of the RSPB. She did not know we knew about the plovers, and, in her anxiety to prevent us from making the discovery, offered us an immediate lift back to London in her car. On other occasions I have arrived quite by chance to find such delicacies as a purple heron, an eider or a long-tailed duck.

Another visit I remember particularly was the LNHS field meeting at Tring on 27 August 1939, when all of us realized that war was coming and that this might well be the last field trip for some time. Many people were talking about their plans in case of war, and how they would take their wives down to the country, or some such. I also remember having to persuade a group of fellow members that what they were looking at was not a reeve but a curlew-sandpiper, which fortunately soon flew to settle the matter with its white rump. This too was the occasion when I first met Richard Richardson, then only seventeen, who was to illustrate so many of my books after the war. Having no 'bins' of his own, he borrowed mine to look at a black tern, which was new to him. John and Eileen Parrinder, then comparatively new members, were also there.

When I first joined the Society there was a mysterious item in the calendar of field meetings that just said 'North Kent Marshes'. I soon satisfied my curiosity by going on one of these, and found that it involved going to High Halstow on a long-lost branch line of the Southern Railway, and walking down the hill, past a farm called Swigshole, on to the grazing marshes that line the Thames between Gravesend and the Medway and then along the Thames shore from Egypt Bay to St Mary's Bay. This was one of the Ornithological Section's star outings, and rarely failed to produce something worthwhile. The path ran along the edge of a wood with a heronry, which is now a National Nature Reserve, and has some claim to be the largest heronry in Britain, then along several fleets and marsh drains that usually produced some interesting waterfowl, a garganey if you were really lucky. I also remember seeing butcher's broom growing in an overgrown hedgerow. But it was the Thames shore that was your best chance, and that is where I saw, for instance, my first black-tailed godwit and my first black terns, though these were so distant that I could only see a few black dots among a swirling mass of white terns. Incidentally, I have never since seen black terns flocking with common or Arctic terns.

High Halstow was not the only place covered by the magical 'North Kent Marshes' in the pre-war LNHS meetings programmes. A little further down the Thames Estuary, where it joins the Medway, is the Isle of Grain, one of several 'islands' along the east coast which may once have been, but are no longer, actual islands. Sometimes, instead of going by train to High Halstow, we would take a coach to the end of the road, to a point where now you are surrounded by monstrous oil silos, but then had a magnificent unspoiled beach, backed by grazing marshes, to walk eastwards along until you reached Yantlet Creek, the rivulet that nearly separates the Isle of Grain from the mainland. It was just across Yantlet Creek, in a marshy fleet close to the sea-wall, that I saw my first avocets, on 4 August 1946, again in the company of John Parrinder.

The public causeway across the old Staines Reservoirs was a more accessible birdwatching site and meeting place of my early days with the Society. There in the winter half of the year one could be reasonably sure of finding not only goosander, goldeneye and often smew, but also one or more of that redoubtable trio, A. Holte Macpherson, uncrowned king of Inner London birds; George Carmichael Low, a fashionable physician famed for his soothing bedside manner, saying, when a grebe had just dived, 'It'll come up again. It'll come up again'; and W. E. Glegg, historian of the birds of both Essex and Middlesex. I believe that when I first swam into their ken as an extremely novice birdwatcher, I amused them by sporting an umbrella — I never have trusted the English climate!

Another notable location was Harry Witherby's Graciouspond Farm at Chobham, Surrey, just outside our radius, where I remember our member Max Nicholson being present to help Witherby show us round, and we saw breeding curlews.

But my carefree days of birdwatching were soon to be shackled. Some time in late 1935, Cynthia Longfield, the famous dragonfly expert, who was then chairman of the Ornithological Section, asked me to become the Section's honorary secretary. I may add that I distinguished myself at my first committee meeting by forgetting to bring the minute book. From my first field meeting after becoming Hon. Sec., I have a vivid memory of seeing my first crossbills, in Windsor Great Park, and being fascinated by the vivid flashes of red and orange as they flew from tree to tree. I also remember, on my first field meeting in Epping Forest, seeing my first white admiral. I have not been to the Forest for a good many years, but I doubt if I could see one there today.

In 1935 the Society began rapidly to modernize itself, with the launch that autumn of the Ecology Section. Len Parmenter was the leading light in its creation, and I have to confess that at that time I myself had never heard of ecology. Two years later, in 1937, the Section started its survey of Limpsfield Common. The decision to locate the Society's first local ecological survey at Limpsfield Common was largely due to R.W. Robbins living there, so that we did not have to start from scratch. Robbins was a founder member, in 1892, of the North London Natural History Society, which amalgamated with the City of London Entomological and Natural History Society in 1914, to form the London Natural History Society. The authors of the nine short papers that launched the survey in *The London Naturalist* for 1937 included R. W. Robbins, C. P. Castell, J. E. Lousley, Len Parmenter, H. J. Burkill and myself, together with Piers Currie (who I was sorry to see had died earlier this year) on birds and a short paper on lichens by A. H. Norkett, who was not then a Society member.

Limpsfield Common was a good choice because it had a varied mosaic of woodland, grassland and heath, and for three years or so I often joined the parties of members who went down by train from Victoria to Limpsfield once a month. Among those I remember being present were the great field botanist Ted Lousley, Ken Guichard, who after the war went into locust research, and Bill Park, who later worked in the head office of the Nature Conservancy. One visit I vividly remember was in early June 1940, a beautiful sunny day, when the sky was full of aircraft going to and from the Dunkirk beaches, then being evacuated. This was almost the last meeting, for travel on the branch line to Oxted became too difficult in wartime, and in 1941 the Society transferred its attention to the more accessible Surrey common at Bookham, where I look forward to attending its Diamond Jubilee there in two years' time. At the same time our Chingford Branch began a survey of the Cuckoo Pits area of Epping Forest.

The next modernizing step was Dick Homes's invention of the *London Bird Report,* whose first number was for the year 1936. Dick, of course, went on to become president of the BTO, of which I myself became Hon. Sec. in the 1940s. Hitherto the Society's bird records had appeared in *The London Naturalist* under the title of 'Birds in the London Area'. Thus my own first bird records for the Society appeared in the *LN*, not the *LBR.* One was of two hawfinches seen at Nonsuch Park, Cheam (which had not then acquired its later notoriety among comedians), on 23 June 1933. Another, because in those days we followed the prevailing custom of recording first arrivals and latest departures, was of a first willow warbler at Chislehurst on 15 April 1934. Nowadays, I may say, I have virtually lost the capacity to hear either the willow warbler or chiffchaff song, though I can still manage their 'hooeet' and 'hweet' notes.

In those days we practised a somewhat rudimentary form of twitching, and I usually went with a group of LNHS members that included Dick Homes, Geoffrey Paulson, Treherne Morgan and John Wightman. We visited such places as Hastings, where purple sandpipers had been reported on the groynes, and the New Grounds on the Severn, where the Wildfowl and Wetlands Trust now is, to see the white-fronted geese. On 11 December 1937, for instance, besides the white-fronts, we saw wigeon, shoveler, cormorants, grey herons and one or two rock pipits. Nobody then would have dared to think of a lesser white-front, first recorded there by Peter Scott in 1945, but which presumably might well have been there in 1937.

For the first year or two the *LN* continued to carry papers on birds — including my own first for the Society, on starling roosts in NE Surrey — leaving only notes for the *LBR.* By 1937 I had acquired a new function as Recorder for Mammals, Reptiles and Amphibians. My first report consisted of a species list and a list of twenty-nine members who contributed records. A selection of the names from this list will give you an idea of who were the most active LNHS members in those years: Stanley Austin, Harold J. Burkill, Cyril Castell, the distinguished entomologist Cyril Collenette, W. L. Colyer, John Dallas, Ken Guichard, P. J. Hanson, John L. Harrison, Phil Hollom, Dick Homes, A. B. Hornblower (the indefatigable Hon. Sec.), G. Hopkins (the editor of the *LN*), Ted Lousley, Geoffrey Manser (who was the only one of them who later came to live, as head of the local primary school, in my post-war village of Chinnor), Treherne Morgan, Max Nicholson (the godfather of the Nature Conservancy), Tony Norris, the well-known dipterist Len Parmenter, R. W. Pethen (our then librarian), R. W. Robbins, John E. Roberts (the official bird recorder for Bushy Park and Hampton Court, who wrote an excellent little book called *A year with nature,* which I hope is still in our library. Yes, it is. Ed.), and J. Ross, who at that time was the key LNHS member in the Epping Forest area.

By 1938 I found myself increasingly drawn into the Society's affairs, as a member of Council, as the author of a paper in the *LN* on the status of the grey squirrel in the London Area, and as a member of the Recording Committee of the Ornithological Section, which produced the *LBR.*

Much of this happy activity was brought to a juddering full stop by the war in September 1939. There were no more indoor meetings until February 1940 and field meetings were much curtailed. The North Kent Marshes and the Blackwater Estuary were officially declared out of bounds for non-essential visits.

An interesting sidelight on the value of natural history studies in wartime was given by the Society's president, J. B. Foster, in his Presidential Address on 24 February 1940. He spoke of 'a friend of mine, who produced from under his sock a piece of flannel on which was stitched a pad of muslin, which he told me was full of lice. He was collecting figures about the vital statistics of lice, while providing the necessary nourishment for the parasites on his leg'.

The absence of many of our younger and more active members on war service made it difficult to fill all the offices of the Society. Piers Currie and Dick Homes were in the Royal Artillery, John Wightman in the Royal Navy, Geoffrey Beven in the Royal Air Force and Treherne Morgan sadly a prisoner-of-war — mercifully all came through the war unscathed. Fortunately our Hon. Sec., A. B. Hornblower, was able to stay with us throughout. Being engaged on work first for the Ministry of Information and later in the Operational Research Section of RAF Coastal Command, I was able myself to fill two gaps, first to edit the *LBR* and a year or two later the *LN* as well. Fortunately paper rationing made both of them much slimmer volumes. This pressure led me to persuade Ralph Hale, who is still with us in his nineties, to exchange posts on the Ornithological Section, I becoming chairman and he the Hon. Sec. Luckily committee meetings were very few during the war. One of my first acts after the war was thankfully to abdicate the chairmanship in favour of Cynthia Longfield, who had just returned from her war work.

One wartime incident that sticks in my mind is standing on the front steps of the London School of Hygiene and Tropical Medicine, waiting to welcome General Sir Alan Brooke, Chief of the Imperial General Staff. He was a keen bird photographer and had promised to show some of his work to the Society. I remember him arriving by staff car and striding up the steps, but I am afraid not a single one of his pictures stays in my mind.

During the war, of course, bird-watching in coastal south-east England was impossible, so it was a wonderful celebration of the return of peace-time bird-watching when on VE Day plus 1 (9 May 1945, a public holiday) John Parrinder and I found two black-winged stilts in a marsh pool near the sea-wall at Cooling on the North Kent Marshes. They were part of a small invasion, due to them being flooded out of their breeding sites when the Dutch opened their dykes as a wartime defensive measure.

Within a year of the end of the war I left London to be assistant editor of *The Countryman* at Burford in the Cotswolds, so I had to surrender my various offices to members who were more directly in touch with the Society's area. My mammal recordership was the last to go. So I really know rather little about the life and times of the Society after 1946. Luckily Brad Ashby had joined us in the latter part of the war, and was able to help John Parrinder with the early post-war *LBR*s.

My last direct involvement was a co-author of the New Naturalist volume called *The birds of the London Area since 1900*, published in 1957. Dick Homes was chairman of the committee which produced this excellent book, and my other co-authors were Brad Ashby, Geoffrey Beven, John F. Burton, Stanley Cramp, H. F. Greenfield, Wilfred Melluish, John Parrinder, B. A. Richards, W. G. Teagle and R. B. Warren. Two other members from the pre-war past sat on the steering committee, Clem Acland and Cyril Collenette.

May I finally say that I am delighted to be able to mention today the names of so many active former members of the Society, most of them my friends. Some of them you will recognize, but others are probably unknown to the membership of the 1990s.

Well, I hope you all now realize that you don't need to go out creating dinosaurs. You have one right here.

Book review

The Sun Islands. A natural history of the Isles of Scilly. Patrick Coulcher. The Book Guild Ltd, Lewes. 1999. 175 pp., 66 coloured plates. £17.95, hardback with glossy dust jacket. ISBN 1 85776 348 3.

Those of you who have read Patrick Coulcher's *A natural history of the Cuckmere Valley* will know that with this, his latest work, a good read is assured. The Isles of Scilly are well known for their equable climate where flowers, trees and shrubs from much warmer climes than ours have been grown successfully for well over a century, especially in the world-famous Tresco Abbey Gardens. Surprisingly, relatively few serious naturalists have visited the islands in the past, though those that had were a fairly select band who studied the plants, insects, spiders and birds, and indeed made some notable discoveries, not least of which being that occasional rare vagrant birds from across the Atlantic had turned up here. But it wasn't until the 1950s that naturalists devoted more attention to this idyllic archipelago. In fact, in late 1956 several members of the London Natural History Society met over coffee following a meeting in Keppel Street and the idea of a bird observatory was discussed. It was becoming apparent that more than just the occasional American vagrant was being reported from Scilly, and further investigation was called for. The result was that the St Agnes Bird Observatory was founded. This venture commenced operations in March 1957 and ran for every spring and autumn (as well as though most summers) until the end of 1967. By then Scilly really was on the ornithological map, and more and more naturalists of all persuasions (including large numbers of autumn twitchers) have been visiting there.

The present book is a superb introduction to the natural history of these islands and Patrick Coulcher's approach is most refreshing. The scene is set by introducing us to the area, from prehistory and legend, early man in Scilly (10,000 BC to AD 43), the Roman occupation, the early medieval period, the medieval period, and the post-medieval period from 1540 to the present. Next we are taken on a tour of the main islands and smaller island groups, starting with St Martin's and ending with the largest island, St Mary's. On each island we are introduced to the birds, plants, habitats and topography, butterflies (some unique subspecies are found on Scilly), and the bulb fields, often with other introduced plants growing amongst the bulbs. The species encountered are not necessarily repeated for each island, which would result in the text being a catalogue, but selections are made during tours around and across the islands. It is this approach which I found so pleasing and so refreshing even though I have been visiting the islands for longer than I dare admit! Because birds and flowering plants are so conspicuous on Scilly, they naturally feature prominently throughout, so it is very useful that checklists of them are included with notes on occurrence for the birds.

When I saw this book in the shops on St Mary's I was at first minded not to bother with it as there have been so many books on the Isles of Scilly, all largely repeating the same things, but, I went inside and had a look. Needless to say, I came out with it convinced there and then that this was different from the run of the mill that I have read so many times. Now, having read it and referred to it subsequently, I can strongly recommend it to any naturalist visiting the islands, whether they be complete beginner or experienced. It is good, easy, informative reading and gives the natural history the high priority it deserves on this delightful island group.

For those making their first visit to Scilly, either by the sea crossing or by air, they will soon realize the thrills they are in for. I would recommend joining one of the regular guided wildlife tours that are run from St Mary's where the leader will cover the ground in much the same way as has Patrick Coulcher.

K. H. HYATT

Resurvey of the Beverley Brook

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Summary

A resurvey of the Beverley Brook took place over the period 15 March 1998 to 16 November 1999. The resurvey sought to replicate a survey carried out in 1988 and to collect additional data about flora and fauna. The aim of the resurvey was to obtain current ecological data about the Beverley Brook in order to monitor any changes to the flora and fauna caused by a proposed change to the main water source which feeds the Brook. This paper does not attempt to detail the results of the resurvey. It gives brief details and draws attention to where copies of the full report can be found.

Introduction

The 1988 survey

A mostly vegetative and morphological survey of the Beverley Brook corridor had been carried out in 1988 by David Stubbs of the London Wildlife Trust. The survey was commissioned by the Rivers Division of Thames Water Authority whose responsibilities were taken over by the National Rivers Authority in 1989, and a report, 'Beverley Catchment Ecological Survey', was published in the September (Stubbs 1989). The results of this survey were used as a baseline for the resurvey of Beverley Brook in 1998–9. Members of the London Natural History Society and the London Wildlife Trust combined to create a team to survey the Brook and to monitor the changes. A series of field meetings and individual visits was arranged.

The Beverley Brook

The Brook starts its above-ground flow in the Borough of Sutton, south of Worcester Park Sewage Treatment Works (Stubbs 1989), and is part of the same water catchment area as the Wandle and Hogsmill Rivers. The headwaters of these three catchments commence on or near the dip slope spring line of the North Downs Chalk aquifer, although the Beverley Brook does not start as a chalk-fed stream (National Rivers Authority 1994). The Brook has three main tributaries; the Pyl, East Pyl and Coombe Brooks. Flowing through the London Boroughs of Sutton, Merton, Kingston upon Thames, Richmond upon Thames and Wandsworth, the Brook joins the River Thames near Putney Bridge. The urban environment through which it flows is alleviated by areas of woodland, amenity grassland and often by a thin strip of trees and shrubs on its banks. It passes through Wimbledon Common and Richmond Park, both of which have SSSI designations. In the past the Brook has been highly modified with frequent culverts, straightening and artificial banks and substrates, and the water quality has always been classified as poor.

Resurvey

Need

Treated sewage effluent, which can constitute 90 per cent of the flow, enters the Brook from Worcester Park Sewage Treatment Works. Towards the end of 1997 it became known that Thames Water were planning to close the works. Upon closure, the sewage would be pumped to an upgraded Sewage Treatment Works (STW) by the Hogsmill River at Kingston. Treated effluent would then be pumped back to Worcester Park to keep the Beverley Brook flowing. The remainder of the flow comes from surface water run-off. Modern treatment methods at Hogsmill STW would provide a higher quality of water which would allow the ecological value and potential of the Brook to increase. The stated objective in the December 1999 Consultative document on the Local Environment Agency Plan for the Beverley Brook (in a scale of 1 to 5 with 1 being the highest quality) was RE 4, i.e. River Ecosystem 4: water of fair quality suitable for coarse fish populations (Environment Agency 1999). The Environment Agency (EA) would be monitoring the effects of the change but it was decided, by the initiators of the resurvey, that an independent overview should be obtained to monitor the changes.

Method

In 1988 David Stubbs divided the Brook into numbered reaches each corresponding to logical physical units, e.g. stretches between main roads. Full survey details recorded for each reach included physical details of the channel (e.g. substrate), banks (e.g. height), vegetation (in-channel and banks) with special note of dominant, characteristic and rare species, adjacent habitats or land uses, observations on birds and other fauna of note *and an appraisal of the intrinsic conservation value and potential vulnerability to engineering works.* Sections that could be enhanced by appropriate management were also noted. Habitat maps were produced which recorded the information found.

Using this baseline the aim of the resurvey was to compare the habitat maps produced in 1988 to the current situation and to collect more detailed information on the flora of the Brook. In addition, the aim was to record as much of the fauna as possible which might also form the basis of future comparison. The resurvey therefore took a similar approach to that carried out in 1988, although a thorough collection of detailed physical features such as substrates and an examination of the three main tributaries could not be undertaken due to lack of time and human resources. During the resurvey a small amount of aquatic invertebrate sampling was completed in four reaches. No chemical analysis of the water was undertaken but this information should be available from the EA.

In 1988 David Stubbs allocated Conservation Evaluation Criteria to **a)** the channel and banks and **b)** adjacent habitats using a system and terminology adapted by the London Ecology Unit (LEU) from the Nature Conservancy Council Draft Methodology for River Corridor Survey (NCC undated) which related to the LEU standard site evaluation criteria. These criteria were applied to the results of the 1998–9 survey and are described in the full report.

Results

The resurvey has confirmed the Beverley Brook as a valuable urban river. Although there are problems, the Brook provides wildlife with a green corridor and the local people with, in most parts, a pleasant outlook, paths to walk along and recreation areas. It is often defined in official documents as of poor ecological value compared to other rivers. However it is an attractive little river with much interest, flowing as it does between and behind gardens and through open areas where it becomes an important extra resource for wildlife and London's biodiversity.

Overall there has been little change in the habitats bordering the river since 1988 but there have been losses of some notable plants such as marsh yellowcress *Rorippa islandica* (*R. palustris*) and blue water speedwell *Veronica anagallis aquatica* during the last ten years. Management of the Brook has not improved since 1988 with much of it continuing to suffer from shading due to overhanging trees. Rubbish on its banks and in the channel continues to be an issue that requires attention together with dilapidated banks and silting. With so many different riparian owners, often London Boroughs, this is perhaps inevitable. Enhancement opportunities do exist and these have been detailed in the resurvey report.

Copies of the full resurvey report, together with a copy of the relevant pages from the David Stubbs survey, have been lodged in the libraries of the London Natural History Society and the London Wildlife Trust. The flora and fauna for each reach of the Brook have been recorded separately. The species lists together with detailed habitat maps are directly comparable with those of the 1988 survey. The report also gives the methods used, perceived limitations and other aspects relating to the resurvey.

The future

The aim of the resurvey was to obtain data about the current species of flora and fauna before the change of water source occurred. It is anticipated that, in time, the water quality and the general ecology of the Brook will improve and subsequent changes can be noted in a future survey. However any future survey will be complicated by major construction work which is likely to be undertaken on the Beverley Brook as part of a Flood Alleviation Scheme which, at the time of writing, is going through a consultation process. It may be many years before the ecology of the Brook improves and it may, as a result of the flood alleviation work, probably deteriorate before it improves. The survey team intend to take an active part in on-going discussion and consultation about the Beverley Brook, and the collected data together with the enhancement proposals will be a useful resource.

Acknowledgements

I am grateful to Jacqueline Shane, Elizabeth Cheesman and Una Sutcliffe for their support and commitment during the resurvey. They were core members of the organizing team and have provided much useful comment and suggestions about this paper. I would also like to thank Shirley Goodwin for her helpful comments on the draft paper. Thanks are due also to those people and organizations who took part in the resurvey, some of them attending meetings regularly and also working independently on their own stretch of river. There are too many names to list here but they are acknowledged in the full report.

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Book review

Ground beetles. Trevor G. Forsythe. Naturalists' Handbooks 8. The Richmond Publishing Co. Ltd, Slough. 2000. 96 pp. £15 hardback, ISBN 0 85546 2647; £8.95 paperback, ISBN 0 85546 2639.

This book is a new edition of the author's *Common ground beetles*, first published in 1986. However, as the change of name implies, it is not a simple up-dating of the earlier work but a comprehensive revision to include all Coleoptera: Carabidae on the British list. It therefore offers itself as the alternative to the standard 1974 work of Carl Lindroth which has recently been republished by the Royal Entomological Society, unfortunately without revision to include 'new' species in the key.

The book follows the usual pattern of the Naturalists' Handbooks: after an introduction there are sections dealing with the behaviour and biology of ground beetles, their identification and, finally, techniques and suggestions for further work with carabids. The first and last of these chapters, providing comprehensive overviews, are little altered from the earlier work (indeed Martin Luff is still listed as the national recorder although he relinquished this position after completing the provisional British distribution). The central section of identification keys, however, has necessarily expanded from thirty-five to fifty-four pages to accommodate species new to the British list as well as those rarer species which were not completely keyed out in the first edition. In addition to established British species, some migrants (actual or potential, such as *Asaphidion caraboides*) are included. The colour plates by Sophie Allington are unchanged (although one might wish there were more) and the keys are augmented by many line drawings of critical elements, a valuable feature of the Naturalists' Handbooks. Entomological jargon is avoided where possible and all critical features are illustrated.

After a page to confirm that the beetle is a carabid, identification is through six sub-keys: Key 1 should take the reader directly to one of five keys (based largely on taxonomically related genera). This is an improvement on the system in the first edition and somewhat easier to use than the strictly taxonomic sub-keys of Lindroth although it does involve some repetition of couplets. Within these keys genera are not always grouped systematically which detracts from phylogenetic understanding but allows identification to proceed using clear morphological features rather than depending on fine points at early stages of the key. Appreciation of a key is somewhat subjective, depending on the experience and needs of the user. The primary concern, of course, is whether it works. There seem to be no outright errors in the key although the use of presence or absence of wings to separate the common species *Trechus obtusus* and *T. quadristriatus* is likely to cause some erroneous diagnoses. There are problematic groups within the Carabidae, for which the best keys provide supplementary descriptions to confirm, or contradict, the determination. The current edition goes some way in listing additional features for difficult species and often suggests alternative couplets. The non-taxonomic approach leads to fragmented pathways which may startle the practiced coleopterist (indeed the separation of *Bembidion nigropiceum* and *B. inustum* from the rest of the genus seems whimsical) but are justified if they allow more reliable progress through the key; this is particularly apparent in the harpaline sub-key 5. Such keys have the disadvantage that a dubious couplet may leave the identifier not knowing even the genus of their specimen. This seems unlikely in the present case and, indeed, the reworked key for *Harpalus* species is much less error prone than in the previous edition. The most difficult species are often separated by examination of the genitalia: these figures are more comprehensive than in any other British publication although a surprising omission is the sibling pair *Pterostichus nigrita* and *P. rhaeticus*. It could be argued that, given a non-systematic key, it should be possible to reach the most common species early in a search. This is not true here where the country's most recorded species, *Pterostichus madidus*, is not reached until the seventy-first couplet of the final sub-key. Of course, the student will soon become familiar with such common species and not need to key them at all.

Some aspects of the revision are disappointing. The 1977 nomenclature of Pope is retained rather than using that of Luff's 1998 distribution and other recent works; nor is a list of synonyms provided. Thus the novice may have difficulty in matching, for instance, their *Bembidion unicolor* to the *B. mannerheimi* of current literature. Similarly outdated are the descriptions of rarity: species recorded from fewer than one hundred 10-km grid squares in 1986 are marked with an asterisk. This confers undue rarity status on relatively common species, such as *Platyderus ruficollis*, and understates the threat to genuinely rare species. Conservation of such species is, after all, why many people wish to identify insects in the first place; it would not have been difficult to incorporate codes based on recent distribution work.

Anyone undertaking large-scale identification of ground beetles will, as the author stresses, inevitably have to refer to other keys as well as museum collections and expert coleopterists. Nevertheless, this revised work is a lucid, comprehensive and economical starting point for students and naturalists without entomological expertise. Its up-to-date nature, illustrations and clarity will also make it a useful adjunct for more experienced practical coleopterists.

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The flora of Holland Park, 1999: native, naturalized and introduced vascular plants and bryophytes

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Summary

This survey of the native, naturalized and introduced vascular plants and bryophytes in Holland Park took place throughout 1999, and the species recorded are listed. These include 218 vascular plant species, subspecies and hybrids, of which over a quarter appear to have been planted, sown or otherwise introduced. Several *Taraxacum* dandelion microspecies were also noted. Thirty-seven bryophyte species were recorded. No national or local rarities were found. The history of the site is outlined. The principal habitats are described briefly and past records are summarized. Recent increases in species diversity through introductions are noted, and suggestions for further increases are proposed.

Introduction

The object of this survey was to record the native, naturalized and introduced vascular plants and bryophytes present in Holland Park during 1999. This was done in the course of about fifty visits, each from half an hour to two hours in duration. Bryophytes were recorded mainly in the winter period. Reference was made to reports relating to the ecology of the Park. Kensington Local Studies Library, London Metropolitan Archives, the London Natural History Society library in Imperial College and libraries of The Natural History Museum were searched for past records and recent comments on urban ecology. The results of the survey are given in this report, with a brief history and description of the Park, and references to previous records relating to its ground flora.

Holland Park

Holland Park, until 1952 the private grounds of historic Holland House, is a public park on the western side of central London, owned by the Royal Borough of Kensington and Chelsea (Figure 1). Its National Grid reference is TQ247798. It extends northwards from Kensington High Street, where the main entrance is situated, almost to Holland Park Avenue, Notting Hill. Its area is twenty-one hectares. The southern thirteen hectares consist of ornamental grounds, with recreational, cultural and other facilities for public use. The remaining part, known as the Northern Woodlands, is an important urban wildlife habitat which is managed for conservation by the Borough Ecology Service.

History

From Norman times the De Veres, Earls of Oxford, owned this part of Middlesex, but by the beginning of the seventeenth century Sir Walter Cope, influential at Court, had acquired Kensington village and the pastures which surrounded it. About 1602 he began to build the grandiose 'Cope's Castle', which became Holland House when he was succeeded by his son-in-law Sir Henry Rich, later the Earl of Holland. Rich made many improvements to the house and grounds, but supported the losing side in the Civil War. In 1649 he was beheaded by Cromwell, who took Holland House as a headquarters for his generals.

On the Restoration, it was returned to the Holland family, their lavish life-style was resumed, and the ornamental grounds were extended. A map of 1694–5 shows 'The Wilderness', a fashionable feature of the period, here consisting of eight tree-lined paths radiating from a central point. Its outline is still a discernible feature of today's Northern Woodlands.

Around the mid eighteenth century the property was acquired by Henry Fox, later Baron of Holland, who carried out extensive landscaping and planting of exotic trees. He was succeeded by his grandson, Henry Richard Fox, who made Holland House into a noted social, political and cultural centre. He died in 1840. The fourth Lord Holland and his wife added many features to the house and garden, and continued the tradition of fashionable life-style. After his death in 1859 portions of the estate were sold off for housing developments, in order to finance his widow and maintain the property, which subsequently passed to the related Ilchester family.

On the outbreak of war in 1939 Holland House was vacated, and in September 1940 the building was destroyed by fire following an incendiary bomb attack. In 1952 Lord Ilchester sold the property to the London County Council and it was adapted for use as a public park. When powers were transferred to the Greater London Council in 1965 it remained under central control, but on dissolution of the latter in 1986 it passed to the Royal Borough of Kensington and Chelsea. A Management Strategy, including an appraisal by the London Wildlife Trust of the Park's natural resources, was prepared. This led to establishment in 1990 of the Borough Ecology Service, adoption of a conservation programme for the Northern Woodlands, and creation of the Wildlife Reserve. The Friends of Holland Park, founded in 1978, have contributed many improvements, including donations of trees and plants, and have published ecological features in their newsletter.

Habitats

London Clay and river terrace gravels

Holland Park lies on the south-west side of Campden Hill, which is based on London Clay, with deposits of flood-plain gravels from a time when the Thames flowed at a much higher level. When building of the mansion commenced, pastures surrounded it. These are shown on a late seventeenth-century map of

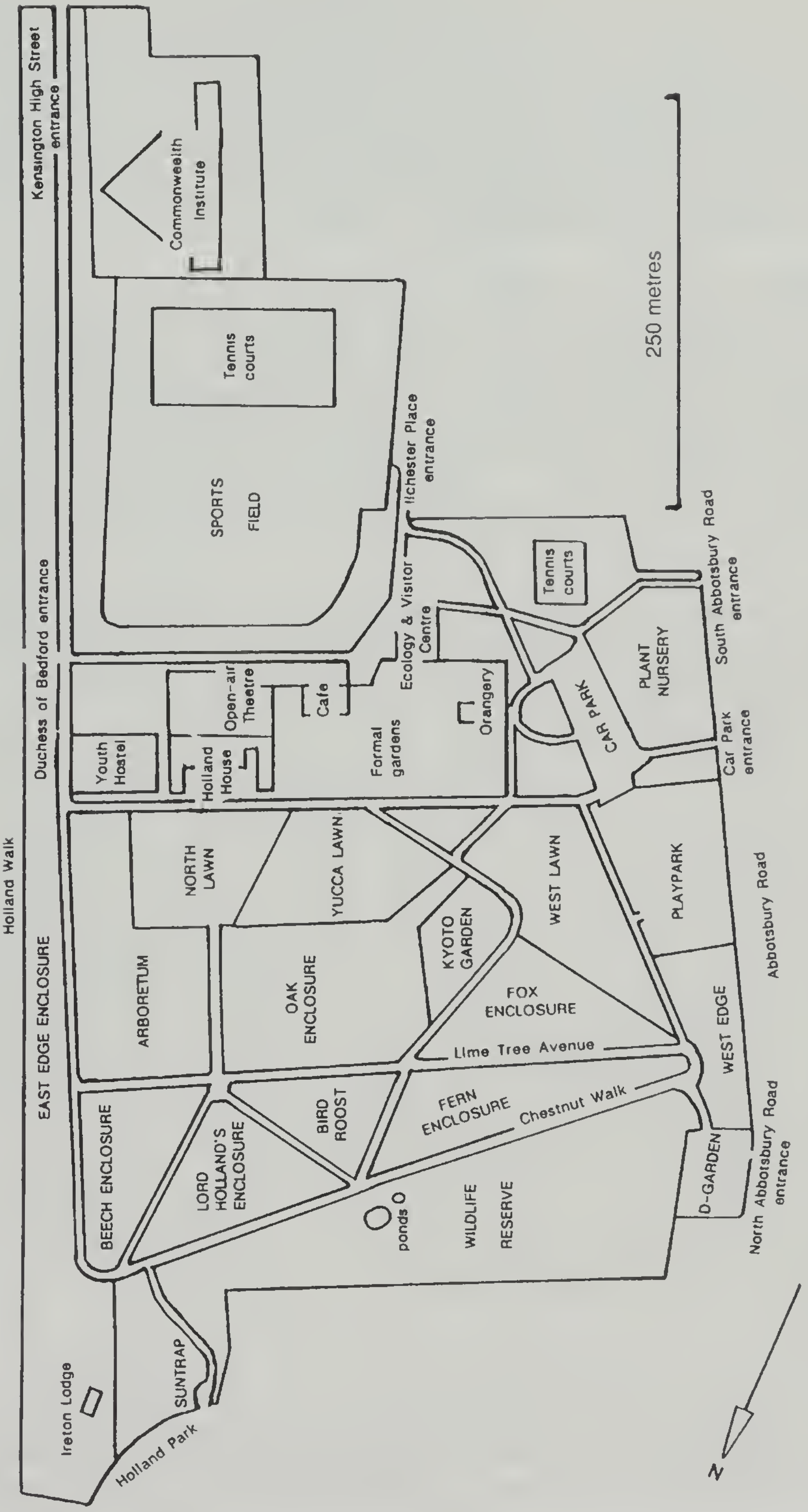

FIGURE 1. Holland Park. Locations referred to in text.

the property, with their field names: The Great Breaches, The Little Breaches, Great Hill Field, and so on. The flora of these would have been relatively poor. It probably included two species still found here, although now generally scarce in London due to loss of habitats. They are *Lotus pedunculatus* greater bird's-foot trefoil, associated with wet meadows on clay, and *Medicago arabica* spotted medick, native to Thames river terrace gravels (Burton 1983). They neatly indicate the separate elements of the substrate. These are also apparent in the contrast between the lush ground flora on clay beneath the old poplar in Chestnut Walk, and the sparse equivalent (good for small mosses) on gravel under the big horse-chestnut in Lime Tree Avenue.

Woodlands

Except where planted, as in Kensington Gardens, woodland is rare on river terrace gravels (Burton 1983). Holland Park woods, now a notable inner London feature, originated as plantations created by successive owners of the property. In part they are a legacy of ornamental landscaping, especially in the mid eighteenth century, from which some choice specimens survive in remnants of formal settings. Other planting, especially from the mid nineteenth century, had a more prosaic function — to screen off new housing in the vicinity. The view from the north front of the mansion, to Harrow Hill and beyond, had been particularly prized, but by 1851 it was 'becoming much disfigured by the erection of large masses of houses in the nearer view, just beyond the park; and as the belt of plantation which surrounds the park on this side is on very low ground, as compared with the house and the outside country, this . . . has now been found to be a defect. The remedy that has been most skilfully provided is the planting of another mass of trees and shrubs all along the higher ground of the park, nearer the house; and although this young plantation looks very stiff and out of place at present, yet, when it grows up sufficiently, the trees will be thinned out and thrown into groups, so as to cover all the objects that need concealing . . .' (Kemp 1851). Similar screening plantations were established along the eastern and western boundaries, and have since developed into the secondary woodland of the Wildlife Reserve and other enclosures.

The sparsity of natural woodland flora can be attributed in the first place to the planted origins of the trees on this species-poor substrate. Efforts to establish woodland plants have been made in the past. Bluebells have proved successful, but more diverse plantings in the nineteen-fifties ultimately failed, no doubt for many reasons, such as lack of maintenance, inappropriate species, storm damage, drying out of sites, climatic variations, vandalism and so on. Apparently there have been few, if any, examples of spontaneous establishment of desirable species, for reasons which have also applied to new plantations at Milton Keynes. These lacked 'the attractive and interesting woodland herbs usually associated with mature woodlands . . . due to their isolation from existing woodlands as a source of colonist species and also to the very poor dispersal and colonising ability of many woodland species such as primrose (*Primula vulgaris*), bluebell (*Hyacinthoides non-scripta*), bugle (*Ajuga reptans*) and yellow archangel (*Lamiastrum galeobdolon*). This means that even in the very long term the developing field layer may remain species poor . . . the rapid development of a more appropriate field layer can only be achieved by the introduction of the desired species' (Francis and Street 1993).

The most intractable areas here as regards ground-level herbage are the secondary woodland enclosures. An ecological appraisal carried out for the Borough by the London Wildlife Trust commented: 'The ground layer in the wood is limited by the dense growth of scrub . . . It should be cultivated and then sown with tall herbs and early flowering plants' (RBK&C 1986). A few years later a report by the London Ecology Unit included a similar observation: 'Below the understorey the variety of field layer species is low and typical of heavily shaded and nutrient-rich soils. Bramble and ivy are often abundant, to the exclusion of any other species'. In the southern part of the Park, the flora of the Arboretum, Oak enclosure, West Lawn, Yucca Lawn and One O'Clock Club was also found to be very limited (RBK&C 1994).

Meantime, little appears to have altered. Even the mature plantations, more open at ground level, have poor floras. In the Oak enclosure, for instance, the best finds during 1999 were a few plants each of *Glechoma hederacea* ground ivy, *Veronica hederifolia* ivy-leaved speedwell and *Luzula campestris* field wood-rush. In the Arboretum, where trees and scrub are scattered in rough grassland, a natural community of *Lotus pedunculatus* greater bird's-foot trefoil and other leguminous species in the south-west corner was almost the only feature of interest.

Under some of the more mature trees colonies of early-flowering plants, including snowdrops, daffodils, lily-of-the-valley and cyclamens, have been successfully established. Together with bluebells, they provide attractive displays before the leaf canopy closes over.

Later on, the most conspicuous herbage is seen in semi-shade conditions, especially along path verges. Blue-flowered *Pentaglottis sempervirens* green alkanet, of garden origin but now naturalized throughout Britain, contrasts with native *Silene dioica* red campion. The latter seems to have increased greatly here during recent years (Elizabeth Norman, pers. comm.), whether through natural spreading or artificial sowing is unknown.

The Wildlife Reserve and vicinity

The Wildlife Reserve was established in 1990 in the largest of the Northern Woodlands enclosures. An old leaf dump in the open central area was cleared away and replaced in 1991 by a pond. Next to it a 'meadow' was created, using subsoil from a neighbouring garden, and in 1995 an additional small pond/marsh was made. Appropriate pondside and aquatic species were introduced and many of these are now growing well. *Sison amomum* stone parsley is among the most successful plants in this area.

During recent times the meadow has been treated to mowing, digging out of thistles, and sheep-grazing, so the herbage has undergone changes. Some species present in 1999, such as *Tussilago farfara* coltsfoot and *Stellaria graminea* lesser stitchwort, may have been deliberately introduced. The abundant *Calystegia* bindweeds certainly were not. They include both familiar kinds, large and hedge, and their hybrid *Calystegia* × *lucana*, which is frequent in Greater London (Stace 1997). These plants were examined by *Calystegia* specialist Dr R. K. Brummitt, of the Royal Botanic Gardens, Kew, who visited the site.

The greater part of the Wildlife Reserve consists of secondary woodland and scrub, which has been partially opened up by paths. *Stachys sylvatica* hedge woundwort, *Arum maculatum* lords-and-ladies and *Geranium robertianum* herb Robert are among examples of natural flora here. Towards the western end there is evidence of earlier planting, including *Dryopteris dilatata* broad buckler-fern, *Ruscus aculeatus* butcher's broom and *Allium triquetrum* three-cornered garlic.

By the entrance to the Reserve a wildflower seed mixture produced a good range of species. Further down Chestnut Walk the flourishing colony of *Agrostemma githago* corncockle has become a well-known spectacle, and other cornfield species are now present.

Other habitats

In the southern part of the Park are miscellaneous small habitats, such as flower-beds, the Open-air Theatre terrace, the nursery, the car park, lawns, and along tennis-court fences. Some twenty-five species not present in the Northern Woodlands were found here, including *Medicago arabica* spotted medick. Others were mainly lawn herbage and casual weeds.

Vascular plants — past records of native and naturalized species

The private period

During the long period of private ownership there are few references to the wild or naturalized flora. Lord Ilchester (1937), referring to the avenue up from Kensington High Street, writes: 'Trees and bushes skirt the ascent on both sides, and beneath them in spring a profusion of bluebells carpet the ground'.

It was difficult to obtain access to the Park before 1939, but Eric Simms managed to visit it a number of times in order to record birds. He noted: 'The northern part of Holland House grounds was in 1936–39 almost virgin woodland — undisturbed and secluded, fool's parsley, bluebells, grew in great profusion' (Brown 1963).

Wartime and after

Throughout the war, defence services were based in the grounds, which suffered disturbance and neglect. According to a press release issued by the London County Council on 23 June 1952, just after the property had been acquired for public use: 'The Council have been informed by the Kensington Borough Council that during the war a number of missiles fell in the grounds of Holland House, and that difficulty was experienced in searching for them because the grounds were overgrown . . . ' On 15 November 1940 a report had been 'received of four high explosive bombs, three of which were located and dealt with, but the search for the other was abandoned owing to thick undergrowth', and on 11 May 1941 three reports were received of thuds but owing to very thick undergrowth search was abandoned (LCC 1952).

When Lord Ilchester decided to dispose of the property there was much public concern as to its future use. In March 1950 he received a delegation from the London Natural History Society and showed its members round the grounds. A letter from the Society, signed by Cynthia Longfield, was subsequently sent to the Parks Committee of the London County Council, describing the woodland area and strongly recommending that it should be established as a nature reserve. 'The most abundant tree is the common elm with a dense undergrowth of suckers; an occasional birch . . . The rest of the wood is a remnant of plantations dating back from the 18th century, and includes horse chestnut, sycamore, oak, poplar, plane and ash, with the shrubs hawthorn, elder and holly. The woodland is rather dense and in any open space is usually covered with a matted growth of bramble' (LCC 1950).

Restoration 1952–1958

Following acquisition of the property in 1952, the Parks Committee of the London County Council was confronted with the huge task of restoration of the grounds and of adapting them to public use. Very fortunately, Frederick Hilliar, in charge during these first years, has left a graphic account of problems faced, difficulties overcome, and successes achieved during that period (Hilliar 1952–9). There were buried incendiary bombs to be located and disposed of, overgrown paths and lawns to be cleared, dangerous trees felled, and drains restored to function. Much of the work related to formal ornamental areas in the vicinity of the ruined house, but efforts were also made to establish a more or less 'natural' ground flora in the woods.

Already in 1952 seeds of 'some woodland subjects, i.e. primulas, anemone, etc., were germinated, being the first towards a large stock of plants that it is hoped to raise and naturalise in the woodlands'. Sufficient clearing was done to enable spring-flowering bulbs to be planted in the woodland enclosures.

By autumn 1953 he reports: 'In places cleared last winter it has been possible to naturalise quite large areas, particularly with plantings of bulbs. Altogether 6,000 crocus, 2,500 *Scilla siberica* [Siberian squill], and 5 hundredweights of narcissus have been planted, also about 200 primroses and 200 *Anemone nemorosa* [wood anemone] that have been grown from seed for this purpose. A number of *Digitalis* [foxglove] have also been grown for the woodland.

'In the woodland areas that have been cleared for over a year the common foxglove *Digitalis purpurea* has flowered in drifts of thousands. A reputed feature of the foxglove is that it will not grow in overgrown or neglected woodland, but as soon as rubbish, brambles, etc., are removed it immediately establishes itself. This can be seen on the sites cleared, compared with those still untouched.'

In spring 1955 'the continued planting of bulbs in and adjacent to the woodland has begun to produce the desired effect. The display of crocus, fritillarias, erythroniums and particularly daffodils have caused much favourable comment'. During autumn of the same year a 'large number of ferns and other woodland plants have been planted in selected areas'.

An ambitious project was undertaken in 1956. 'The suggestion of growing a collection of native plants has been discussed for a long time. A start has now been made and a number of species planted. A strip of woodland has been sufficiently cleared for the initial groups, and the plants have been arranged in botanical sequence from one end (near Abbotsbury Road) to the other (near No. 1 entrance). The original scheme was to include only true native plants. There is some doubt as to the origin of many, and for that reason it is now thought better to include any plant (native or introduced) that may be found growing naturally in the British Isles, provided that it is included in the flora of Clapham, Tutin and Warburg.'

In 1958 there is a further passage referring to this project. 'The collection of British plants has been steadily increased, by the summer of 1959 should include approximately 350 species, to enable this planting to extend. Further clearing has had to be done, particularly brambles and sycamore seedlings. A few poor specimens of larger trees have been removed and the branches thinned on others to allow more light onto the site. Some stonework has been incorporated to provide suitable homes for various species. The number of plants now growing is sufficient to provide both display and interest. It is now possible to visualise the site in a few years' time, after the existing plants have become well established and other gaps filled. Many of the native plants of Britain are woodland subjects, and for that reason a woodland site is the most suitable for such a collection.' However, Mr Hilliar's expectations were not fulfilled. His account concludes at the end of 1958, and a decade later few traces remained of this enterprise.

The 1960s and 1970s

Evelyn Brown, of the London Natural History Society, began regular bird recording in the Park from 1958, and at the same time noted some features of the flora. In a paper on 'The bird life of Holland Park' (Brown 1963) she observes: 'The natural herb layer shows a lot of cow parsley (*Anthriscus sylvestris*) and bluebells (*Hyacinthoides non-scripta*) in the spring, together with grass and ivy, and later in the year some enchanter's nightshade (*Circaea lutetiana*) can be found, but a good deal of planting of daffodils, ferns, fritillaries and other suitable plants has taken place.' She considered incidentally that such introductions 'may well have a bearing on the unusual variety of birds that has appeared in the Park recently'. Around the house ruins and on adjacent waste land she noted other species, including *Chamerion angustifolium* rosebay willowherb, *Rumex acetosa* sorrel and *Silene dioica* red campion. She made no reference then to the 'British flora' project, but some years later, when president of the Society, in an address on 'Studying wildlife in Holland Park' (Brown 1972) she warned: 'Some care should be taken in studying the flora since an attempt was made some years ago to grow many species of wild flowers along the north side of Chestnut Avenue. Some, of course, have thriven to the extinction of others, but it was always on the shady side for many plants.

However, there is a clearing at the end of Chestnut Avenue where dusky cranesbill (*Geranium phaeum*) and globe flower (*Trollius europaeus*) are to be found'. She also noted that *Viscum album* mistletoe 'has appeared on a chestnut tree on the edge of the wood'. (Twelve years later 'a large clump of mistletoe' was observed on an *Aesculus flava* yellow buckeye in the West Lawn (Mitchell 1984) — probably the same tree.)

Dutch elm disease

In the course of the above address Evelyn Brown observed that there had been 'little change' in the Northern Woodlands during the previous decade ('A few trees have fallen or been cut down, mostly the older ones'), but Dutch elm disease was by then advancing through London. The next few years saw the destruction of the Park's population of mature specimens and at the same time *Acer pseudoplatanus* sycamore was attacked by sooty bark disease. In all, some two thousand trees were lost. In place of these a dense growth of elm suckers and sycamore seedlings, accompanied by ivy, nettles and brambles, began to dominate the woodland enclosures to the detriment of other ground flora. By the end of the decade the effects were obvious. Rupert Booth, a biologist, commented that 'the number of species of wild flowers has sadly decreased, dramatically, in the past few years — probably due to the surge of brambles, nettles and sycamore brought on by the increase of light to the ground flora due to the loss of the Elm' (FHP 1981).

The 'great storm' of 1987

Many more trees were lost in the great storm, forty-nine in Lime Tree Avenue alone. A report compiled soon after the event (Mitchell and Hallett, undated) anticipated its effects on the herb layer. 'Ground vegetation will respond very rapidly. Some will be brambles, nettles and dock, etc., and some internal areas of these should be retained for their value to assorted wildlife, but broad margins to paths may need clearing of these coarse plants to favour foxgloves, red campion, bluebells or other attractive plants, some of which may turn up unexpectedly, especially where the soil has been disturbed deeply by rising root-plates'. The woods were further damaged by another severe storm in 1990.

Flora of the Wildlife Reserve 1990–1998

Before the establishment of the Wildlife Reserve, a survey of the site's flora was carried out by ecologist Rosalind Singer (1989, 1990). In the wooded area she found twenty-seven species, of which one-third appeared to have been planted. These included *Ruscus aculeatus* butcher's broom, previously noted by the London Wildlife Trust (RBK&C 1986), and *Maianthemum bifolium* May lily — both apparently relics of the late 1950s' 'British flora' project. The latter was not subsequently reported until refound in May 2000. According to Stace (1997) this species is 'rarely persistent where planted in woods'.

Chenopodium bonus-henricus Good King Henry and *Plantago media* hoary plantain were the most interesting of the species recorded by Singer in the 'Waste ground area', a poor habitat owing to the presence of the leaf dump. Ten years before, Rupert Booth had warned that the latter was spreading and adversely affecting trees and wildlife in the vicinity (FHP 1981). In the 'Damp open area' Singer noted *Ranunculus bulbosus* bulbous buttercup, and also *Iris pseudacorus* yellow iris, which was subsequently reintroduced by the new pond.

During the summer of 1993 the London Ecology Unit surveyed the flora of the woodland enclosures (RBK&C 1997), and many of the species recently planted around the new pond were recorded. Three years later the Reserve was resurveyed by Joan Bovarnick, Rhoddy Wood and other Friends of Holland Park (Bovarnick and Wood 1996), revealing apparent successes or failures among the introductions. Records were also kept in 1996 by the Ecology Service. In 1998 *Pulicaria dysenterica* common fleabane was first noted here (Freed 1998).

Some species found in the Reserve during the above periods were not seen during 1999. Common sorrel had perhaps been grazed away by sheep during 1997, but this and other missing plants may well reappear in seasons to come. They are as follows (an asterisk indicates species presumed to have been introduced):

* *Nymphaea alba* white water-lily, London Ecology Unit, 1993 (RBK&C 1997).
Ranunculus bulbosus bulbous buttercup (Singer 1990).
Rumex acetosa common sorrel (Bovarnick and Wood 1996), Borough Ecology Service, 1996 (RBK&C 1997).
* *Hypericum maculatum* imperforate St John's-wort, LEU 1993 (RBK&C 1997).
* *Sanguisorba minor* salad burnet, LEU, 1993 (RBK&C 1997).
* *Impatiens glandulifera* Indian balsam, Borough Ecology Service, 1996 (RBK&C 1997).
Plantago media hoary plantain (Singer 1990), Borough Ecology Service, 1996 (RBK&C 1997).
Pulicaria dysenterica common fleabane (Freed 1998).
* *Butomus umbellatus* flowering rush, LEU, 1993 (RBK&C 1997, Bovarnick and Wood 1996).
* *Sagittaria sagittifolia* arrowhead (Bovarnick and Wood 1996).
* *Carex otrubae* false fox-sedge, LEU 1993 (RBK&C 1997).
* *Polygonatum multiflorum* Solomon's-seal (Bovarnick and Wood 1996), Borough Ecology Service, 1996 (RBK&C 1997).
* *Maianthemum bifolium* May lily (Singer 1990). Refound 2000.

Other Park records 1997–1998

The *Rubus* bramble population of Holland Park was surveyed in 1997 by David Allen (Allen 1998). He found nine microspecies, including some rarities, as follows:

Rubus rudis Weihe.
R. moylei Barton & Riddlesd.
R. dasyphyllus (Rogers) E.S. Marshall.
R. cissburiensis Barton & Riddlesd.
R. britannicus Rogers.
R. nemorosus Hayne ex Willd.
R. tuberculatus Bab.
R. trichodes W. C. R. Wats. Apparently the only previous Middlesex records of this are from ancient woodlands in the north-west of the county.
R. norvicensis A. L. Bull & Edees. Associated with the Norwich district and otherwise unknown in south-east England.

The last two microspecies may have been introduced here with nursery stock.

Campanula trachelium nettle-leaved bellflower was found on the south side of Lime Tree Avenue during July 1998 (Freed 1998), but not seen in 1999.

Bryophytes — past records

The first references to bryophytes in Holland Park are general observations — 'up to 1960 there was little moss . . . In 1960, however, partly because of encouragement by the Park staff there was a marked increase in the amount of moss in the woods' (Brown 1963), and 'the Clean Air Act is taking effect in the increase in mosses' (Brown 1972).

Hennediella macrophylla, found by J. C. Gardiner 'in thin turf by track near Commonwealth Institute, Holland Park, 3.iv.1981' (Wiltshire and Ellis 1995), appears to be the first named moss on record from the Park. It was noteworthy because it is an alien species, native to New Zealand, discovered in Britain only in 1965.

During 1994–1996 bryophytes were recorded in Holland Park (Wiltshire, unpublished). Most species were refound during this survey, with the following exceptions:

Didymodon luridus. Suntrap, 1994.
D. fallax. Dutch garden, 1995.
Plagiomnium undulatum. Yucca Lawn, West Lawn, 1994.
Rhynchostegium murale. Wildlife Reserve on old concrete, 1994 (det. A. C. Smith).
Eurhynchium hians. West Lawn, 1994.

Thirty-five species of moss and two of liverwort were found during 1999. Particulars follow the vascular plants list.

Conclusions

Two hundred and eighteen native, naturalized and introduced vascular plant species, subspecies and hybrids were recorded in Holland Park during 1999. About sixty of these (around 27 per cent) appear to have been introduced, mainly in the Wildlife Reserve and along Chestnut Walk during the past decade. Twenty-five species, mostly lawn herbage and casual weeds, were in the southern part of the Park only. No national or local rarities were found, but *Lotus pedunculatus* greater bird's-foot trefoil and *Medicago arabica* spotted medick are scarce in London. Some species recorded during recent years were not refound but may well still be present. The total number of vascular plant taxa (not including microspecies) in the Park is probably about two hundred and fifty.

None of the thirty-seven bryophyte species found is rare, but the alien moss *Hennediella macrophylla*, which occurs on moist well-trodden path verges, is still uncommon in London.

The natural flora of Holland Park is limited owing to lack of habitat diversity. There is very little available space in the public amenities sector of the Park, and much of the Northern Woodlands area is shaded and ivy-covered at ground level. However, two distinctly different types of plantation are represented there. The Arboretum and Oak enclosures originated in the eighteenth century as part of an ornamental landscaping scheme, and still contain fine mature trees. Beneath them the ground is relatively open, and has been fairly widely planted with bluebells, daffodils, snowdrops, cyclamens and lily-of-the-valley, which make a good display in spring. The addition of natural woodland species, such as ferns, *Oxalis acetosella* wood sorrel, *Anemone nemorosa* wood anemone, *Primula vulgaris* primrose and *Melica uniflora* wood melick, could be attempted.

The other six enclosures (Wildlife Reserve, Bird Roost, Fox, Fern, East Edge and West Edge) derive mainly from screen planting in the mid nineteenth century. During the past decade, establishment of the ponds and meadow area (in all only about one hundred metres long by fifty metres wide) in the centre of the Wildlife Reserve has successfully created new habitats. Plants introduced here have added substantially to the flora of the Park. The woodland areas have been preserved, but opened up with paths and glades, which allow for introduction or development of shade-tolerant species.

The remaining enclosures in this group are all much smaller. Since the 1987 storm there has been some replanting with native trees, but now these are crowded by elm suckers, sycamore saplings and other scrub. There is a programme in place to reduce congestion, which may make room for establishment of woodland plants. 'Woodland ground flora introduction is a priority in habitat creation schemes, it will otherwise take generations to develop' (Gilbert and Anderson 1998).

Hedgerows have been planted along some of the enclosure fences. These should in due course enable appropriate plants to be encouraged (some are already present) or introduced. Good examples may be seen in the Wildlife Garden of The Natural History Museum (Ware 1999). These include *Primula* *vulgaris* primrose, *Campanula trachelium* nettle-leaved bellflower, *Viola riviniana* common dog violet, *Ranunculus ficaria* lesser celandine, *Torilis japonica* upright hedge parsley and *Lonicera periclymenum* honeysuckle. Path verges, especially along Chestnut Walk, provide good potential sites if tall invasive herbage can be kept at bay. Ground cover plants, such as *Vinca minor* lesser periwinkle and *Lamiastrum galeobdolon* yellow archangel, might help.

In general, there is limited scope for increasing floral diversity in the current Northern Woodlands conservation area, as similar conditions prevail over so much of it and there is so little open space. 'The best woodland for nature conservation is irregular, and includes large open areas and a variable density of trees and shrubs' (Gilbert and Anderson 1998). Inclusion of the Arboretum, which is partly rough grassland, and the Oak enclosure, with its majestic trees, would go some way towards achieving this ideal. They belong to the same landscape design as Lord Holland's and Beech enclosures, and have a basic ground flora in common. No loss of amenity would be involved, since, like the other woodland sites, they are closed to the public and viewed only from paths. Such enlargement of the conservation area would permit creation of a flowery meadow in the Arboretum or a wildlife garden, perhaps with access which would bring school and other groups closer to nature. Such changes would not only result in an increase of floral diversity, but could be combined with restoration of the famous tree collection established by Lord Holland two hundred and fifty years ago.

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Native, naturalized and introduced vascular plants recorded in Holland Park during 1999

Nomenclature and arrangement are in accordance with Stace (1997). * indicates species known or believed to have been introduced by means of sowing, planting, or as a result of development works.

EQUISETACEAE horsetail family

Equisetum arvense field horsetail. In Reserve by small pond, in car park and Nursery.

DENNSTAEDTIACEAE bracken family

Pteridium aquilinum bracken. In 'D' Garden, lower part of Reserve woodland, and Chestnut Walk.

DRYOPTERIDACEAE buckler-fern family

Dryopteris filix-mas male fern. Occasional. In Reserve, Fern, Fox and Oak enclosures.

**D. dilatata* broad buckler-fern. A few plants in lower part of Reserve woodland (det. A. Paul).

TAXACEAE yew family

Taxus baccata yew. Seedlings in Reserve woodland.

CERATOPHYLLACEAE hornwort family

**Ceratophyllum demersum* rigid hornwort. Submerged in large pond in Reserve.

RANUNCULACEAE buttercup family

**Caltha palustris* marsh-marigold. Several plants in Reserve by small pond.

**Eranthis hyemalis* winter aconite. A few plants in Lord Holland's enclosure.

Ranunculus acris meadow buttercup. Occasional. In Reserve and Arboretum.

R. repens creeping buttercup. Frequent.

R. bulbosus bulbous buttercup. On grass in Playpark and near Iris Garden.

**R. sceleratus* celery-leaved buttercup. In Reserve by small pond.

**R. lingua* greater spearwort. In Reserve by large pond.

**R. flammula* ssp. *flammula* lesser spearwort. In Reserve by large pond.

R. ficaria ssp. *bulbilifer* lesser celandine. By Chestnut Walk and on other path verges.

PAPAVERACEAE poppy family

Papaver rhoeas common poppy. Occasional. In Arboretum, by Chestnut Walk.

P. dubium ssp. *dubium* long-headed poppy. A plant by N wall of Youth Hostel.

FUMARIACEAE fumitory family

**Pseudofumaria lutea* yellow corydalis. A plant in Reserve by woodland path, by N wall of Holland House.

CANNABACEAE hop family

**Humulus lupulus* hop. By West Lawn, in Fox enclosure, in lower part of Reserve woodland.

URTICACEAE nettle family

Urtica dioica nettle. Frequent.

FAGACEAE beech family

Fagus sylvatica beech. Seedlings in Beech enclosure.

Quercus ilex evergreen oak. Occasional seedlings, grown into slender evergreen bushes (det. A. J. Coombes).

Quercus spp. oaks. Occasional seedlings.

CHENOPODIACEAE goosefoot family

Chenopodium polyspermum many-seeded goosefoot. Occasional. In Oak enclosure, by entrance to Reserve.

C. album fat hen. Occasional. In Suntrap.

Atriplex prostrata spear-leaved orache. Occasional. By Chestnut Walk.

A. patula common orache. Occasional. By Chestnut Walk.

PORTULACACEAE blinks family

Claytonia perfoliata springbeauty. At foot of red oak near top of Chestnut Walk.

Montia fontana ssp. *chondrosperma* blinks. On Theatre lawn.

CARYOPHYLLACEAE pink family

Stellaria media common chickweed. Frequent.

S. graminea lesser stitchwort. By entrance to Reserve and in Reserve meadow.

Cerastium fontanum ssp. *vulgare* common mouse-ear. Occasional. On Theatre lawn.

C. glomeratum sticky mouse-ear. By tennis courts near Commonwealth Institute.

Sagina procumbens ssp. *apetala* annual pearlwort. On Theatre lawn.

**Lychnis flos-cuculi* ragged-robin. In Reserve by small pond.

**Agrostemma githago* corncockle. By Chestnut Walk.

Silene dioica red campion. Abundant in woodland area.

POLYGONACEAE knotweed family

Persicaria maculosa redshank. Occasional. By car park, in Reserve by small pond.

P. lapathifolia pale persicaria. In Nursery.

Polygonum arenastrum equal-leaved knotgrass. By tennis courts near Commonwealth Institute, by Chestnut Walk.

Fallopia japonica Japanese knotweed. Occasional.

F. convolvulus black bindweed. In Fern enclosure opposite Kyoto Garden, in Nursery.

Rumex acetosa common sorrel. In Arboretum.

R. crispus curled dock. Occasional.

R. sanguineus wood dock. Scarce. In bed above Suntrap.

R. obtusifolius broad-leaved dock. Occasional.

MALVACEAE mallow family

**Malva moschata* musk-mallow. By entrance to Reserve.

M. sylvestris common mallow. By entrance to Reserve, in Oak enclosure.

BRASSICACEAE cabbage family

Sisymbrium officinale hedge mustard. Occasional.

Alliaria petiolata garlic mustard. In Lord Holland's enclosure, above Suntrap, in Reserve.

Arabidopsis thaliana thale cress. In Nursery and formal garden beds.

Cardamine flexuosa wavy bitter-cress. Occasional. By pond edge in Kyoto Garden.

C. hirta hairy bitter-cress. Locally abundant.

Capsella bursa-pastoris shepherd's-purse. By tennis courts near Commonwealth Institute.

Coronopus didymus lesser swine-cress. By tennis courts near Commonwealth Institute, on Theatre lawn, by Chestnut Walk.

Sinapis arvensis charlock. A plant above Suntrap.

Raphanus raphanistrum ssp. *raphanistrum* wild radish. A plant (white form) in car park.

PRIMULACEAE primrose family

**Primula vulgaris* primrose. By entrance to Reserve.

**P. veris* cowslip. By entrance to Reserve.

**Cyclamen* sp. sowbread. In Lord Holland's enclosure.

Anagallis arvensis ssp. *arvensis* scarlet pimpernel. By entrance to Reserve, in Nursery, by Chestnut Walk.

ROSACEAE rose family

Rubus fruticosus agg. bramble. Frequent. For details see Allen (1998).

Potentilla reptans creeping cinquefoil. In Reserve meadow, by N wall of Youth Hostel.

**Fragaria vesca* wild strawberry. By entrance to Reserve, in Reserve by woodland path and on bank by large pond, by N wall of Youth Hostel.

**Duchesnea indica* yellow-flowered strawberry. By Chestnut Walk.

Geum urbanum herb bennet. Occasional. In Suntrap, by entrance to Reserve, in Reserve.

Aphanes australis slender parsley-piert. On Theatre lawn.

FABACEAE pea family

Lotus pedunculatus greater bird's-foot-trefoil. SW corner of Arboretum, in Reserve by small pond.

Vicia cracca tufted vetch. In SW corner of Arboretum, in Reserve meadow.

V. hirsuta hairy tare. In Nursery.

V. sativa ssp. *segetalis* common vetch. In Reserve by small pond.

Lathyrus pratensis meadow vetchling. In SW corner of Arboretum, in Reserve meadow.

Medicago arabica spotted medick. On small lawn by entrance to Kyoto Garden, by tennis courts near Commonwealth Institute.

Trifolium repens white clover. Occasional. In Reserve meadow.

T. dubium lesser trefoil. Occasional. In Reserve meadow, by tennis courts near Commonwealth Institute.

T. pratense red clover. Occasional. In Reserve meadow.

LYTHRACEAE purple loosestrife family

**Lythrum salicaria* purple loosestrife. By Reserve ponds.

ONAGRACEAE willowherb family

Epilobium hirsutum great willowherb. By Reserve ponds.

E. parviflorum hoary willowherb. In shrub bed below Orangery tennis courts, by small pond in Reserve.

E. montanum broad-leaved willowherb. Occasional.

E. tetragonum square-stalked willowherb. Occasional. By entrance to Reserve, in Reserve, in shrub beds below Orangery, in Nursery.

E. roseum pale willowherb. One plant by entrance to Reserve.

Oenothera biennis common evening-primrose. In Nursery.

Circaea lutetiana enchanter's-nightshade. In Suntrap beds, in Reserve.

EUPHORBIACEAE spurge family

Mercurialis perennis dog's mercury. In Reserve woodland above entrance.

M. annua annual mercury. Occasional. Above Suntrap, in Oak enclosure.

Euphorbia peplus petty spurge. Occasional.

HIPPOCASTANACEAE horse-chestnut family

Aesculus hippocastanum horse-chestnut. Seedlings in Reserve, in Arboretum.

ACERACEAE maple family

**Acer platanoides* Norway maple. Seedlings in Beech enclosure.

**A. cappadocicum* Cappadocian maple. Seedlings in Beech enclosure.

A. campestre field maple. Seedlings in Reserve.

A. pseudoplatanus sycamore. Seedlings in Reserve and other wooded enclosures.

OXALIDACEAE wood-sorrel family

Oxalis corniculata procumbent yellow-sorrel. In bed near Iris Garden, by main entrance to Kyoto Garden.

**O. debilis* large-flowered pink-sorrel. A plant by Chestnut Walk.

GERANIACEAE crane's-bill family

**Geranium pratense* meadow crane's-bill. By entrance to Reserve and in Reserve.

G. dissectum cut-leaved crane's-bill. In Reserve.

G. molle dove's-foot crane's-bill. Occasional. By Lime Tree Avenue.

G. robertianum herb Robert. A few plants in Reserve woodland above ponds.

ARALIACEAE ivy family

Hedera helix ivy. Abundant in wooded enclosures, some ssp. *hibernica* Atlantic ivy in Reserve.

APIACEAE carrot family

Anthriscus sylvestris cow parsley. Abundant throughout woodland area.

Conopodium majus pignut. In Arboretum, in Lord Holland's enclosure and Reserve.

Aegopodium podagraria ground-elder. In bed by Suntrap, in Reserve at foot of meadow.

Conium maculatum hemlock. In Nursery, by entrance to Reserve.

**Sison amomum* stone parsley. Numerous in Reserve near ponds and spreading into woodland margins.

**Angelica sylvestris* wild angelica. By large pond in Reserve.

Heracleum sphondylium hogweed. Abundant in Arboretum, occasional elsewhere.

H. sphondylium × *H. mantegazzianum* hybrid hogweed. In Arboretum.

H. mantegazzianum giant hogweed. Abundant in Arboretum, a plant in Reserve.

SOLANACEAE nightshade family

Solanum nigrum black nightshade. Occasional on disturbed ground. In Chestnut Walk, in shrub beds.

S. dulcamara bittersweet. Occasional.

CONVOLVULACEAE bindweed family

Convolvulus arvensis field bindweed. In Nursery and in shrub bed below Orangery.

Calystegia sepium ssp. *sepium* hedge bindweed. In Reserve.

C. × *lucana* (*C. sepium* × *C. silvatica*) hybrid bindweed. In Reserve meadow (det. R. K. Brummitt).

C. silvatica ssp. *disjuncta* large bindweed. In Reserve by ponds and meadow, occasional elsewhere.

MENYANTHACEAE bogbean family

**Menyanthes trifoliata* bogbean. In Reserve in large pond.

BORAGINACEAE borage family

**Symphytum* 'Hidcote Blue' Hidcote comfrey. A plant by Lime Tree Avenue.

**Pentaglottis sempervirens* green alkanet. Frequent.

**Trachystemon orientalis* Abraham-Isaac-Jacob. In Reserve woodland above entrance.

**Myosotis scorpioides* water forget-me-not. In Reserve by small pond.

LAMIACEAE dead-nettle family

Stachys sylvatica hedge woundwort. At shady sites in Reserve.

Ballota nigra ssp. *meridionalis* black horehound. Occasional among other rough herbage.

Lamium album white dead-nettle. Occasional.

L. purpureum red dead-nettle. Occasional.

L. amplexicaule henbit dead-nettle. Along Theatre terrace.

Glechoma hederacea ground ivy. A few plants in Oak enclosure.

**Prunella vulgaris* self-heal. A plant by entrance to Reserve.

**Lycopus europaeus* gypsywort. By small pond in Reserve.

**Mentha aquatica* water mint. By ponds in Reserve, by N wall of Youth Hostel.

PLANTAGINACEAE plantain family

Plantago major ssp. *major* greater plantain. Frequent.

P. lanceolata ribwort plantain. Frequent.

OLEACEAE ash family

Fraxinus excelsior ash. Occasional seedlings.

SCROPHULARIACEAE figwort family

Scrophularia auriculata water figwort. In Reserve by large pond.

Digitalis purpurea foxglove. Occasional.

Veronica serpyllifolia thyme-leaved speedwell. On small lawn by entrance to Kyoto Garden, in Kyoto Garden, on West Lawn.

**V. beccabunga* brooklime. In Reserve by small pond.

V. arvensis wall speedwell. On gravelly ground by Lime Tree Avenue, in beds by Iris Garden.

V. persica common field speedwell. By tennis courts near Commonwealth Institute.

V. hederifolia ssp. *lucorum* ivy-leaved speedwell. In Oak enclosure.

RUBIACEAE bedstraw family

**Galium mollugo* ssp. *mollugo* hedge bedstraw. By entrance to Reserve.

G. aparine cleavers. Occasional.

CAPRIFOLIACEAE honeysuckle family

Sambucus nigra elder. Occasional seedlings. In Reserve, on West Lawn, in wooded enclosures.

DIPSACACEAE teasel family

Dipsacus fullonum wild teasel. About 30 plants in glade by woodland path in Reserve.

**Knautia arvensis* field scabious. By entrance to Reserve.

**Succisa pratensis* devil's-bit scabious. By entrance to Reserve, in Reserve.

ASTERACEAE daisy family

Arctium minus lesser burdock. Occasional. Frequent by Chestnut Walk.

Carduus crispus ssp. *multiflorus* welted thistle. A large plant in Reserve above pond, others along Lime Tree Avenue.

Cirsium vulgare spear thistle. Frequent.

C. arvense creeping thistle. Frequent.

**Centaurea cyanus* cornflower. A few plants by Chestnut Avenue.

**C. nigra* common knapweed. By entrance to Reserve.

**Cichorium intybus* chicory. By entrance to Reserve.

Lapsana communis nipplewort. Occasional. In Reserve, in Oak enclosure.

Hypochaeris radicata cat's-ear. In Reserve on bank above large pond, by tennis courts near Commonwealth Institute.

Picris echioides bristly ox-tongue. Occasional. In Reserve, by Chestnut Walk.

Sonchus arvensis perennial sow-thistle. Occasional. In Reserve.

S. oleraceus smooth sow-thistle. Occasional. In Reserve, by Chestnut Walk.

S. asper prickly sow-thistle. Occasional. In Reserve, by Chestnut Walk.

Lactuca serriola prickly lettuce. In car park.

Taraxacum dandelion microspecies. Specimens are in The Natural History Museum.

- *Taraxacum exacutum* Markl. Chestnut Walk (det. A. J. Richards and A. A. Dudman).
- *T. pseudohamatum* Dahlst. Above Suntrap and in Reserve (det. A. A. Dudman).
- *T. atactum* Sahlin & Soest. By entrance to Reserve (det. A. A. Dudman).
- *T. undulatiflorum* M. P. Christ. In Lime Tree Avenue (det. A. A. Dudman).
- *T. altissimum* H. Lindb. Top of Lime Tree Avenue (det. A. A. Dudman).
- *T. ekmannii* Dahlst. In Reserve (det. A. A. Dudman).
- *T. huelphersianum* G. E. Haglund. By entrance to Reserve (det. A. A. Dudman).

Crepis capillaris smooth hawk's-beard. By tennis courts near Commonwealth Institute.

C. vesicaria beaked hawk's-beard. By tennis courts near Commonwealth Institute, in Reserve.

Gnaphalium uliginosum marsh cudweed. A plant by Chestnut Walk.

Conyza canadensis Canadian fleabane. Occasional.

C. sumatrensis Guernsey fleabane. Occasional. By entrance to Reserve, in Reserve.

Bellis perennis daisy. On lawns and playing fields.

Tanacetum parthenium feverfew. In enclosure near entrance to Ireton Lodge.

Artemisia vulgaris mugwort. In Reserve, by Chestnut Walk.

Achillea millefolium yarrow. By entrance to Reserve.

**Chrysanthemum segetum* corn marigold. By Chestnut Walk.

**Leucanthemum vulgare* oxeye daisy. By entrance to Reserve.

Matricaria discoidea pineappleweed. Pathside near entrance from Kensington High Street.

Tripleurospermum inodorum scentless mayweed. A plant in Reserve meadow.

Senecio jacobaea common ragwort. Occasional.

S. squalidus Oxford ragwort. A plant by Chestnut Walk.

S. vulgaris groundsel. Occasional.

Tussilago farfara coltsfoot. In Reserve meadow.

**Helianthus annuus* sunflower. A plant by Chestnut Walk.

Galinsoga parviflora gallant-soldier. By tennis courts below Orangery.

**Eupatorium cannabinum* hemp-agrimony. By small pond in Reserve.

ALISMATACEAE water-plantain family

**Alisma plantago-aquatica* water-plantain. One flowering shoot by small pond in Reserve.

ARACEAE lords-and-ladies family

Arum maculatum lords-and-ladies. Frequent in lower part of Reserve woodland.

LEMNACEAE duckweed family

**Lemna minuta* least duckweed. In Reserve pond, in centre tank in Oak enclosure.

JUNCACEAE rush family

**Juncus inflexus* hard rush. In Reserve by small pond.
J. effusus soft-rush. In Reserve by small pond.
Luzula campestris field wood-rush. In Oak enclosure.

CYPERACEAE sedge family

**Carex pendula* pendulous sedge. In Reserve near large pond.

POACEAE grass family

Festuca rubra red fescue. Occasional.
F. ovina sheep's fescue. By entrance to Reserve.
Lolium perenne perennial rye-grass. On playing field.
Poa annua annual meadow-grass. Frequent.
P. trivialis rough meadow-grass. Occasional. In Reserve.
P. pratensis smooth meadow-grass. Occasional.
Dactylis glomerata cocksfoot. Frequent. Abundant in Arboretum.
Holcus lanatus Yorkshire fog. Frequent. Abundant in Arboretum.
H. mollis creeping soft-grass. In Arboretum.
Anthoxanthum odoratum sweet vernal-grass. Scarce. In Arboretum, in Oak enclosure.
Agrostis capillaris common bent. Occasional.
A. gigantea black bent. Occasional. In Reserve meadow.
A. stolonifera creeping bent. In Nursery.
Alopecurus pratensis meadow foxtail. Occasional.
Phleum pratense timothy. Occasional.
Anisantha sterilis barren brome. Occasional. In Reserve.
Hordeum murinum wall barley. Occasional.
**Phragmites australis* common reed. In Reserve by ponds.
**Digitaria sanguinalis* hairy finger-grass. In Nursery.

SPARGANIACEAE bur-reed family

**Sparganium erectum* ssp. *neglectum* branched bur-reed. In Reserve by small pond.

TYPHACEAE bulrush family

**Typha latifolia* bulrush. In Reserve by small pond.

LILIACEAE lily family

**Convallaria majalis* lily-of-the-valley. In NE corner of Lord Holland's enclosure.
Hyacinthoides non-scripta, H. non-scripta × H. hispanica, H. hispanica bluebell. Long-established and widespread in various forms. In Lord Holland's, Oak, Beech and other enclosures and in Reserve.
**Allium triquetrum* three-cornered garlic. At W end of Reserve woodland.
**A. ursinum* ramsons. At W end of Reserve woodland.
**Tristagma uniflorum* spring starflower. Small patch near S end of Kensington Walk.
**Leucojum vernum* spring snowflake. A few plants in Arboretum.
**Galanthus* spp. snowdrop. In several enclosures.
**Narcissus pseudonarcissus* and other spp. daffodil. In several enclosures.
**Ruscus aculeatus* butcher's-broom. A clump of plants at lower end of Reserve woodland, two in West Lawn bed.

IRIDACEAE iris family

Iris pseudacorus yellow iris. In Reserve by large pond.
I. foetidissima stinking iris. Occasional. In Reserve and Oak enclosure.

Bryophytes recorded in Holland Park during 1999

Nomenclature and arrangement are in accordance with Blockeel and Long (1998).

MOSSES

POLYTRICHACEAE

Atrichum undulatum. On West Lawn, in Beech enclosure.

DICRANACEAE

Ceratodon purpureus. Frequent.
Dicranella heteromalla. In Oak and Beech enclosures, in Reserve.
Dicranoweisia cirrata. In Lord Holland's enclosure, on poplar by East Edge enclosure.
Campylopus pyriformis. In Reserve at foot of *Quercus rubra* red oak.

FISSIDENTACEAE

Fissidens bryoides. In Reserve.
F. taxifolius. In Reserve.

POTTIACEAE

Pseudocrossidium hornschuchianum. In Dutch Garden.
Bryoerythrophyllum recurvirostrum. On brickwork of north wall of Holland House.
Barbula convoluta. In Dutch Garden, in Reserve.
B. unguiculata. On Holland House brickwork, on Theatre lawn.
Didymodon insulanus. By Chestnut Walk.
D. tophaceus. On stonework at entrance to Kyoto Garden.
Tortula marginata. In Oak enclosure on brickwork of tanks, in Reserve on stonework.
T. muralis. Frequent on stonework.
T. truncata. By Lime Tree Avenue.
T. acaulon var. *acaulon.* By Lime Tree Avenue.
Hennediella macrophylla. On moist gritty path verges.

GRIMMIACEAE

Grimmia pulvinata. On stonework at entrance to Kyoto Garden, on wall at rear of Commonwealth Institute.

BRYACEAE

Pohlia nutans. By Lime Tree Avenue, in Reserve.
Bryum capillare. In Suntrap, in Reserve, on wall at rear of Commonwealth Institute.
B. caespiticium. In Suntrap, by Lime Tree Avenue.
B. argenteum. In Suntrap, by Lime Tree Avenue.
B. gemmiferum. By Lime Tree Avenue, on Theatre lawn.
B. rubens. By Chestnut Walk, in Oak enclosure.

MNIACEAE

Mnium hornum. In Beech and East Edge enclosures, in Reserve.

ORTHOTRICHACEAE

Orthotrichum diaphanum. On base of sycamore by entrance to D-Garden, on elder in Reserve.

AMBLYSTEGIACEAE

Amblystegium serpens. In Oak enclosure, in Reserve.
Calliergonella cuspidata. On West Lawn, in Reserve.

BRACHYTHECIACEAE

Brachythecium rutabulum. On West Lawn, in Reserve.
Rhynchostegium confertum. On West Lawn, in Reserve, in Beech enclosure, etc.
Eurhynchium praelongum. On West Lawn, in Reserve.

PLAGIOTHECIACEAE

Pseudotaxiphyllum elegans. In Lord Holland's and Beech enclosures.

HYPNACEAE

Hypnum cupressiforme. In Oak and Beech enclosures, on West Lawn.
Rhytidiadelphus squarrosus. On West Lawn.

LIVERWORTS

GEOCALYCACEAE

Lophocolea heterophylla. On West Lawn.

LUNULARIACEAE

Lunularia cruciata. By north wall of Holland House, in Kyoto Garden.

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Book review

Understanding lichens. George Baron. The Richmond Publishing Co. Ltd, Slough. 1999. iv + 92pp. £9.95 paperback. ISBN 085546 252 3.

A lichen is a fungus and an alga living symbiotically. It was formerly regarded as a plant, but is now classified amongst the fungi. The use of lichens as environmental indicators makes them especially valuable. The scarcity of books is a major handicap for their study and they are now a neglected group.

Fortunately George Baron has come to the rescue by producing this excellent introductory text. His book is essentially a printed edition of a 1999 desk-top production from the South London Botanical Institute. It covers all aspects of lichen biology, together with chapters on their habitats, uses, classification and literature. It is well-written, accurate, up to date, easily understood, and user-friendly. There are twenty-four superb colour photographs by Frank Dobson and Jeremy Gray of common lichens taken in the field showing their variety of form and provided with descriptive captions. Clear and simple line drawings and several black-and-white photographs enhance the text. My only criticism, a small one, concerns the overuse of 'very' in the plate captions and in the first paragraph of the chapter on lichens and their environment. Here George wisely points out that there are few alien introductions from other countries that cause such conservation problems amongst plants and animals!

The author is in his late eighties and the book is an outstanding piece of work for a person to produce at any age. Its price is perhaps on the high side for an introductory text designed to help beginners. However, it deserves to be widely available in all bookshops. It should do much to encourage and promote the study of lichens. I hope it will remain in print for a long time, with updated editions as further information becomes available, and not join the many works listed in George's final chapter as being 'OOP' — now out of print!

Jack Rodney Laundon

Book review

The birder's bug book. Gilbert Waldbauer. Harvard University Press. 1998 and 2000. 290 pp., 38 colour plates. £17.50 hardbound, 1998, ISBN 0 674 07461 0. £10.50 softback, 2000, ISBN 0 674 00206 7.

The interaction between birds and insects is complex and of great interest, and any publication which popularizes that interest is likely to help bridge the gap which is sometimes evident between birders and entomologists. This book contains much of general interest in this broad subject area and presents it in a reader-friendly, informal manner. Although I do not myself like the semi-autobiographical style of the American author I can see that it is likely to endear the book to a generally interested public readership.

Ten chapters cover Bugs and birds through the ages, The only flying invertebrates, Bugs that birds eat, The bugs that fight back, Bugs that eat birds, The birds that fight back, Bugs that eat people (what has this to do with birds?), People fight back, A brief guide to the insects, and Disappearing diversity. This is not a textbook by any means; rather it is an informative and mildly entertaining work and its appeal is more likely to be the entomologist's offspring than the entomologist him or herself. However, it does contain a serious message, particularly in the final chapter, and getting this message across to people in general seems like a jolly good idea to me. There is little here that the average reader would not already be aware of (one would hope) but it is a useful chapter to throw at friends, colleagues, children, politicians, spouses and any other non-specialists that you might encounter on your travels. It would make an interesting birthday present for someone with an existing interest in natural history who wishes to learn more. Hopefully, reading it might encourage in them a greater interest in entomology.

Colin W. Plant

The early spread of *Hydrocotyle ranunculoides* in Middlesex

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Middlesex, though no longer an administrative unit, is still the name used for the area which existed as a county until the creation of Greater London. It is here used in the same sense as by Watson (1873), who numbered it vice-county 21. Historically, it has not been immune to invasion by aquatic weeds. Canadian waterweed *Elodea canadensis* Michx., which was first recorded from Middlesex near the Thames and in the Lea in 1854, had become 'very common' in less than twenty years (Trimen and Dyer 1869). Its rapid spread was undoubtedly facilitated by the movement of boats on navigable waterways, which already included the canal system connecting the Colne on the western boundary, the Thames on the south and the Lea on the east. In more recent times there has been less commercial traffic but a much larger trade in products for use in ponds in small private gardens, including oxygenating plants. These include parrot's-feather *Myriophyllum aquaticum* (Vell.) Verdc., New Zealand pigmyweed *Crassula helmsii* (Kirk) Cockayne, and lately also floating pennywort *Hydrocotyle ranunculoides* L.f. (misnamed 'marsh pennywort' which is *H. vulgaris* L.), all of which grow very rapidly in conditions which suit them. The first two have been known in the wild in Middlesex since 1992 and 1981 respectively (Kent 2001).

The objects of this paper are to document the arrival of the third in the vice-county and speculate on its future spread.

The first record of *Hydrocotyle ranunculoides* (Payne 1992, Heywood et al. 1993) in counties adjacent to Middlesex, and indeed in Britain, was in 1990 in the River Chelmer at Chelmsford in South Essex (v.c. 18), where it can still be found abundantly. In subsequent years it spread downstream from there and into the Chelmer–Blackwater canal. These plants are about forty kilometres from the Middlesex boundary. There was also a find in 1991 in a flooded gravel pit at North Shoebury, further away in South Essex, not connected by water with the Chelmer.

In 1994 *Hydrocotyle ranunculoides* was found in two areas much closer, across the Thames and the Lea. The southern localities were a ditch on Ham Moor south of Weybridge and by Coxes Mill Pond nearby; these were the first records of the species from Surrey (v.c. 17). By 1995 it formed a wide zone all round the millpond and occurred almost continuously from there down the Wey Navigation to the confluence of the Wey and the Thames (Phillips 1995). In 1996 the plant had to be cut back in order to maintain navigation along the Wey (Newman and Dawson 1998). The confluence is within sight of the Middlesex shore of the Thames, but the plant was not observed to have crossed the larger river until 1999, when it was found at the ford leading to Sudbury Court island.

The other 1994 locality was Upper Goldings Hill Pond on the edge of Epping Forest. This is also in South Essex, but much nearer to Middlesex, being a little over five kilometres from the boundary. Here too it rapidly became pestilential; K.J. Adams (pers. comm.) measured a radial growth of twenty-nine centimetres in seven cool days in 1995. Attempts to remove it by hand-pulling in 1996 failed because its brittle stolons and roots were entangled in a bed of *Typha latifolia* L., and even after three trailer loads had been removed a similar attempt in 1998 was also unsuccessful. The latter occasion is perhaps the only one when reproduction by seed and abundant flowering has been observed in Britain. Other Essex colonies found in 1995, one in a pond further north and east in

Epping Forest, the other in Highams Park Lake only three kilometres from the Middlesex boundary, were perhaps successfully eradicated, thanks to prompt action by the Conservators of Epping Forest.

The boundary mentioned follows a winding route which corresponds almost exactly to the course of the River Lea as it was in the mid nineteenth century, before improvements to the navigable waterway and diversions for the construction of reservoirs. One of the few stretches where it is the same as the present course of the river is alongside Walthamstow Marshes, on the Essex side (Burton 1994). In 1997, B. S. Wurzell found a population of *Hydrocotyle ranunculoides* in a ditch on the Marshes in v.c. 18, about a hundred metres from the vice-county boundary. It is still there, and nearby the plant is now a nuisance in a yachting marina.

Still in 1997, a couple of months after Mr Wurzell's discovery, *Hydrocotyle ranunculoides* was first found in Middlesex, in the course of a London Natural History Society excursion led by David Bevan. There was a fragment of the plant among *Lemna minor* L. and *Spirodela polyrhiza* (L.) Schleid. in the basin of Stonebridge Lock, Tottenham, and an established population nearby, visible only with binoculars, in the Lea Diversionary Channel. It had not been in either place in the previous year. In 1998 I could extend these records about 2,000 metres southward along the Lea Navigation, finding scattered fragments and then huge beds of the plant in the angle of a bend near Upper Clapton. This is on the east side of the waterway, but in Middlesex (v.c. 21). Within this known range, I also found it on the Essex side of the line in the Coppermill Stream among Walthamstow Reservoirs. Similar floating mats of the plant to those in the Lea Navigation, attached to the bank at one side, have been known since 1995 in the River Roding in Essex, which runs about seven kilometres east of the vice-county boundary.

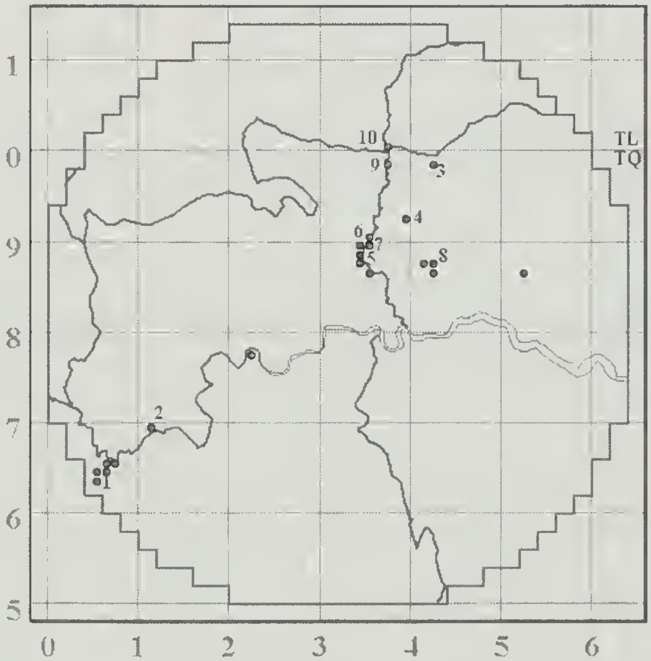

FIGURE 1. Records of *Hydrocotyle ranunculoides* from the LNHS recording area. Each dot indicates one or more records from an area of 1 km^2. Places on the map named in the text are numbered as follows: 1 Coxes Mill Pond, 2 Sudbury Court, 3 Upper Goldings Hill Pond, 4 Higham Park Lake, 5 Walthamstow Marshes, 6 Stonebridge Lock, 7 Walthamstow Reservoirs, 8 River Roding, 9 Enfield Lock, 10 south of Waltham Abbey.

A more significant extension of the known range of the plant was achieved in 1998, when a large mass was filling the end of a short arm of the Lea Navigation near Enfield Lock, about eight kilometres from Stonebridge Lock, and about 1,850 metres further north again there was a clump of it in the Navigation south of Waltham Abbey. The former locality is in Middlesex and was without *Hydrocotyle ranunculoides* in 1996, the latter in v.c. 18 right up against (or possibly just on the other side of) the boundary with v.c. 20 (Herts.), and in any case certainly within the present boundary of Hertfordshire.

The localities mentioned above, with the exception of the more distant ones in Essex, are shown on Figure 1.

Hydrocotyle ranunculoides can survive as small free-floating fragments. When one of these settles in an area of still shallow water without competition from other aquatic macrophytes, it can increase quickly to form large mats; in an enclosed area of water it is likely to have a devastating effect on the existing flora, as observed by Knapp (1996). If a mat is disturbed by wind or the movement of boats, fragments can become detached and are then available to drift away and start new mats elsewhere. The canal system, where the water is almost without flow, can be expected to carry the plant slowly westward from the Lea Navigation via the Hertford Union Canal into the Regent's Canal, and if it survives passage through tunnels into the Grand Union Canal, onward to the west of Middlesex and other vice-counties. *Acorus calamus* L., which has already spread by these routes, forms patches at the side of these waterways which are convenient places for *Hydrocotyle ranunculoides* to lodge. Where the water is deep close to the bank, it is more difficult for the weed to become established.

Drift cannot be the only way in which this plant is dispersed. The ditch on Walthamstow Marshes mentioned is not connected by water with the nearby canal, and is not a likely place for a deliberate introduction. I cannot avoid the conclusion that *Hydrocotyle ranunculoides* can also be carried from one water body to another by birds, as small fragments which can regenerate in water. It can therefore be expected to occur subsequently in detached water bodies near to established populations. This is probably not the way by which it reached all the Essex ponds mentioned. Because the plant is commercially available, it must be assumed that excess material of it has been dumped in publicly accessible water bodies by irresponsible owners of garden ponds and aquaria. So many conservation problems have been created by the release of this species, *Crassula helmsii* and *Myriophyllum aquaticum* to ponds that a campaign to distribute leaflets about the danger at the points of sale of the plants would surely have beneficial results.

Even a campaign of this kind cannot be expected to be totally effective, and we must assume that these weeds will be always with us. The difficulty of controlling *Hydrocotyle ranunculoides* mechanically has already been demonstrated, and Newman and Dawson (1999) have shown that it may not be possible to control it with the herbicides available and approved for use in water. Although this method is to be attempted in the River Lea and associated waterways, the weed can be expected to spread slowly westward from the Lea Valley through the canal system, and also perhaps to appear sporadically in other localities in Middlesex. Any new records of it should be notified to the local Environment Agency office, where information about available control measures will be to hand (Grieve 2000).

Acknowledgements

This short note could not have been written without the kind assistance of Dr K.J. Adams, who supplied me detail of the Essex records. I must also thank the following for their records: Robin Blades, David Bevan, John Edgington, Barry Phillips, Jane Woodliff, Brian Wurzell and the anonymous reviewer of an earlier version of this paper. The records were compiled in a Microsoft Access database, and the map was produced using Dr Alan Morton's Dmap.

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Meadow clary *Salvia pratensis* L. in Middlesex

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Meadow clary *Salvia pratensis* L. is a statutorily protected species which has been recorded as a native in a total of thirty-two 10-km squares in nine vice-counties in England, but has only been recorded from seventeen since 1990. It is a robust, floriferous perennial which occurs in neutral or calcicolous grassland and scrub on calcareous soils, and is very typical of hay meadows. It has also been recorded many times as an introduction, possibly sown in imported grass seed (Rich, Lambrick and McNab 1999).

In 1994, whilst reviewing its distribution and ecology for Plantlife (Rich 1995), I came across a specimen in the Cambridge herbarium (**CGE**) collected by E. F. Shepherd on 18 June 1901 from Lammas Land, Laleham. The record does not appear to have been previously published, and to my knowledge represents the only confirmed record for v.c. 21 Middlesex.

My current thoughts about its occurrence at Laleham are that seed may have been washed down the Thames from its strongholds in Oxfordshire, and is unlikely to have been sown on the communal Lammas lands. I would be interested in any further information on the history and use of this site which may help throw more light on the record.

Acknowledgements

I would like to thank Rodney Burton for prompting me to write up the record, Jane Croft for help and the Keeper of the Cambridge herbarium for access to the herbarium.

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Book review

Wildlife 2000. A Status Report for Hillingdon. Compiled by members of the Hillingdon Natural History Society with line drawings by D.W. Ovenden. 2000. 171 pp., 9 colour plates, A5 spiral-bound. £6. 90 including p. & p. from Mrs A.M. Rix, 31 Norfolk Road, Uxbridge, Middlesex UB8 1BL. Cheques payable to Hillingdon Natural History Society.

Few London boroughs support as rich and diverse a range of habitats and wildlife than that of Hillingdon. This publication documents the current status of the borough's wildlife and, for the better-recorded groups, notes changes that have occurred over the last forty years. The text is enlivened by Denys Ovenden's excellent line drawings, and a series of photocopied colour photographs introduces each section.

A brief introductory chapter covers the geology and range of habitats present. Hillingdon is particularly rich in ancient woodland and the Ruislip Woods are the largest area of such woodland in Greater London. Detailed accounts then follow of the various taxa included. Coverage of the mammals and the birds includes some interesting comparisons between records from the 1960s and those of the present day. Many of these make sombre reading. Brown hare at Heathrow, for example, reduced from forty records in 1966 to four in 2000. Other declines also reflect the national picture and include song thrush, yellowhammer and spotted flycatcher. Bats are covered in some detail, as are the more popular invertebrate groups of butterflies, dragonflies and Orthoptera. There is a comprehensive listing of moths, supplied by Dr A. M. George, but little information on their distribution or frequency. A long list of 'other insect groups' (largely abstracted from surveys carried out by C. W. Plant and J. S. Spooner) includes a brief note on the status of the less-common species. This is followed by a much shorter account of 'non-insect invertebrates' assembled mainly from the records of J. E. D. Milner (spiders) and C. W. Plant (other groups). A list of common plant galls derives from a single meeting at Harefield Place Nature Reserve 1999 and links the fauna to the flora.

Ann Rix has compiled a very useful and comprehensive list of flowering plants, leaving out most trees and shrubs (which are detailed separately by Edred Wood). The majority of these are recent records, combining Ann's own observations, together with a detailed search of recent literature (which included the voluminous lists of plants contained within the official proofs of evidence presented at the Heathrow Terminal 5 Public Inquiry in 1997). Despite this commendably thorough approach, a number of common species are likely to have been overlooked (*Cerastium glomeratum* and *Polygonum arenastrum* for example). The water crowfoot in Harefield village pond was *Ranunculus peltatus* when I last visited it in the early 1990s (not *R. aquatilis* as listed) and *Viola tricolor* (listed at Frays Valley LNR) was almost certainly *V.* × *wittrockiana*. Howard Matthews has added, largely from his own observations, a typically detailed account of the distribution of ferns and horsetails, which includes three sites for the scaly male fern *Dryopteris affinis* ssp. *borreri*, which is seldom recorded in north-west London but may well be overlooked. References are given to papers covering the bryophytes and the fungi of the Borough.

The Report concludes with an overview by Roger Taylor of the many nature reserves in Hillingdon that are managed by the London Wildlife Trust. These include one of London's 'flagships' — Frays Farm Meadows SSSI, for which the Trust has recently taken on an agricultural tenancy and where they have recently restored controlled cattle grazing.

This small book is a fine example of what can be achieved over a very short time span by a dedicated group of local naturalists. They are to be congratulated on producing it to such a high standard and on time to celebrate the new millennium. I hope that it will stimulate other London boroughs to follow suit, perhaps as part of the Biodiversity Action Plan process.

David Bevan

Aspleniaceae and Polypodiaceae in London

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Abstract

These common wall ferns of lowland Britain have been regarded as scarce in London. Observations suggest that this may no longer be the case, *Phyllitis scolopendrium* in particular being widespread in central London. An analysis of data in the *Atlas of ferns of the British Isles* indicates that until 1978 these ferns really were scarcer, both in central London and in other large cities, than in their immediate neighbourhoods. Possible reasons are discussed.

Introduction

Of the spleenworts and their allies, five calcicoles, *Ceterach officinarum, Asplenium adiantum-nigrum, A. trichomanes* ssp. *quadrivalens, A. ruta-muraria* and *Phyllitis scolopendrium*, are widely distributed. Some twenty years ago (Jermy et al. 1978) the last four were recorded as occurring in more than 60 per cent of the English and Welsh hectads, while *C. officinarum*, though it has a more Atlantic distribution, was recorded from about half of these. In lowland Britain they are primarily, indeed, other than *Phyllitis* and *A. adiantum-nigrum*, exclusively, mural ferns; as their natural habitats of rock surfaces and eroding banks have declined, the Aspleniaceae have found wall mortar a suitable substitute. Except, apparently, in and around London. In *The historical flora of Middlesex*, Kent (1975) described the first two taxa as 'very rare' and the third as 'rare and decreasing'. Perivale and Southgate, both more than 15 kilometres from St Paul's, were given as the nearest extant stations for all three. While wall-rue was 'rather common' on old walls, mature plants of hartstongue were 'rare'. Kent's records for these two included only a handful within his Metropolitan Division of v.c. 21, corresponding roughly to an area of 140 km^2 around the Cities of London and Westminster. There is a similar story for the *Polypodia*, which as *Polypodium* agg. occurs in more than 90 per cent of British hectads. Kent described polypody as 'formerly rather common but now rare and decreasing' in Middlesex, and had no recent records from the Metropolitan Division.

The situation was similar in v.c. 18 and 19, South and North Essex, where Jermyn (1974) recorded the five Aspleniaceae as 'very rare', 'uncommon', 'infrequent', 'infrequent' again, and 'thinly scattered', respectively. Apart from isolated records of *Phyllitis scolopendrium* and *Asplenium adiantum-nigrum* in Stratford, one had to go nearly 20 kilometres from St Paul's, to Loughton and Chigwell, for the other spleenworts. Jermyn's nearest records for rustyback and polypody ('uncommon and usually in small quantity') were in Epping, even further from central London.

These and other historical records were aggregated and updated to 1976 by Burton (1983) who remarked 'Ferns of old walls are thinly scattered in our area, and often scarce where they occur, though they have apparently all been scarcer at some time in the past than at present'. Indeed Britten (1881), having mentioned wall-rue as occurring in Hampstead and other suburban districts, remarks that 'it was also found in the brickwork of a kitchen area in Bloomsbury Street, London, in 1866' and pointedly adds 'though here of course it may have been planted', a comment indicating how unusual it must have been to see such ferns in central London.

That they continued to be scarce in and around London until very recently is apparent from Burton's meticulous and authoritative records (Burton 1979 et seq.) of plants within 32 kilometres of St Paul's. A twenty-year sequence from 1978 to 1997 notes fewer than a score of records of the six species mentioned, and although the detailed database is more extensive, no taxon other than

Phyllitis has more than a handful of records from within 10 kilometres of St Paul's (Burton, private communication). By contrast, the commoner ferns of woods and grassland in southern Britain, such as *Polystichum setiferum* and *Ophioglossum vulgatum*, are well represented. The ubiquitous *Dryopteris filix-mas* and *Pteridium aquilinum* are not of interest in this context.

Aspleniaceae and Polypodiaceae in central London

Recently I have looked for wall ferns in and around central London, principally in hectad TQ38 that includes the City of London, and in the Westminster portion of TQ28. My experience suggests that polypody and the mural Aspleniaceae are more common than twenty years ago, and in particular that *Phyllitis scolopendrium* is now an abundant city plant occurring in every tetrad of the Cities of London and Westminster.

In 1997 *Phyllitis scolopendrium*, *Asplenium adiantum-nigrum*, *A. trichomanes* and *Ceterach officinarum* were present on the section of Roman wall in EC2 where J. M. Montgomery had found the first two, and also *A. ruta-muraria*, twenty years ago (Burton 1980, 1981). In 1999 I noted single plants of *C. officinarum* at two other sites, the first nearby, at All-Hallows-by-the-Wall, the second at South Tottenham on concrete walls. *A. adiantum-nigrum*, likewise, grows in at least two other sites in TQ38, Limehouse and Hackney Wick, where there are substantial populations on canalside walls; and as a single plant, in St Giles Churchyard, Holborn, just within TQ28. It is perhaps at its most abundant on a canalside wall at Kensal Green, also TQ28. Both species, for which Kent recorded only two or three extant occurrences in the whole of Middlesex, are now to be found in several sites in central London.

The colony of *Asplenium trichomanes* in EC2 is extensive and of sufficiently recent origin as to raise suspicions of deliberate introduction (Burton 1998). An even larger colony is one of hundreds of plants growing together with *Phyllitis scolopendrium* under railway arches at Mile End, while another covers several metres at the base of a brick wall in hospital grounds in W1, just into the adjacent hectad TQ28. These are clearly of natural origin. Other recent records of *A. trichomanes* include South Tottenham near the site of *Ceterach officinarum*, two separate small colonies on walls in King's Cross, and a number of mature plants on graves in the cemetery at Bunhill Fields, EC1. A less artificial habitat, where it is accompanied by *A. ruta-muraria,* is on imported limestone boulders beside the course of the New River in Islington. This site for wall-rue, together with two in the King's Cross area brings the number of localities in TQ38 to four. In TQ28, *A. ruta-muraria* and *A. adiantum-nigrum* grow together in profusion by the canal at Kensal Green.

Polypodium, like *Ceterach,* seems to be scarcer than *Asplenium.* There is a small number of mature plants at Bunhill Fields cemetery whose graves, immaculately tended by City Corporation gardeners, host many bryophytes and ferns. These can be reliably referred to *Polypodium interjectum* as can an extensive colony on the walls of East India Dock Basin at the eastern extremity of the vice-county. A score or so more stunted plants grow on a stretch of wall close to Tottenham Court Road (TQ28). These too have the sporangial characteristics and the jizz of *P. interjectum*. Interestingly, Kent states that all Middlesex specimens seen by him were referable to *P. vulgare*.

The spread of *Phyllitis scolopendrium* has been remarkable and must be obvious to many. It is a ubiquitous denizen of Georgian and Victorian streets in central London, flourishing on older walls, just below pavement level in basement areas, and beneath gratings. Far from mature plants being rare, the colonies are often of considerable age with individual fronds commonly to 50 cm with an occasional monster of one metre or so. The most impressive site is that at Mile End, where plants both hang from the dripping roofs of the railway arches and form pure stands (one of about 25 m^2 must contain over a thousand plants) on the wet floors.

The trend hinted at by Burton in 1983 seems to have continued, and perhaps accelerated. My searches have been neither systematic nor exhaustive; nevertheless all six species except wall-rue have been seen recently in the City of London, and all except rustyback have been found in Holborn. There are more than twenty sites for the five taxa excluding *Phyllitis* in TQ38 and the adjacent tetrads of TQ28. Polypodiaceae and the mural Aspleniaceae are possibly now as well represented in central London as in the countryside nearby.

Analysis of *Fern atlas* data

For quantitative confirmation that in the past these ferns were really less common in London than its surroundings, a simple statistical test was applied to records in the *Atlas of ferns of the British Isles* (Jermy et al. 1978). The number of hectads with a post-1930 record was noted for the nine urban hectads including and immediately surrounding TQ38, which includes St Paul's. The sixteen adjacent hectads were assumed to be affected by generally similar climatic and edaphic factors and post-1930 records from these suburban hectads noted also. This was done for each of the six taxa, and the results summed to give the data in Table 1. Treating this as a 2 × 2 contingency table, one finds that the difference in relative frequency between urban and suburban sites before 1978 is highly significant (C.L. > 99.5 per cent). The difference is even more pronounced if data for *Phyllitis scolopendrium* are discounted. During the middle of the twentieth century, these ferns were indeed scarce in central London.

TABLE 1. Frequency of the mural Aspleniaceae and Polypodiaceae in central and outer London according to Jermy et al. (1978). Records are summed over the six taxa discussed in the text. The difference in relative frequency between inner and outer London is significant at the 99.5 per cent confidence level.

	Present post-1930	**Absent post-1930**
In 9 central hectads	24	30
In 16 outer hectads	66	30

A look at the distribution maps in Jermy et al. (1978) suggests there may be a similar absence of records near other conurbations. The analysis just described was repeated for four other industrial cities, Birmingham, Liverpool, Manchester and Newcastle, in lowland England. Table 2 gives the results, summed over the four cities and six taxa. The difference between urban and suburban areas before 1978 is again very highly significant, at a confidence level above 99.9 per cent. These two analyses, despite their obvious drawbacks and uncertainties, indicate that between 1930 and 1978 these mural ferns were very much scarcer both in London and in other large industrial cities than in their surrounding areas.

TABLE 2. Frequency of the mural Aspleniaceae and Polypodiaceae in central and outer districts of Birmingham, Liverpool, Manchester and Newcastle according to Jermy et al. (1978). Records are summed over the six taxa and the four cities omitting, for Newcastle, *Ceterach officinarum* which is rare in the North-East. Only land hectads are included. The difference in relative frequency between inner and outer districts is significant at the 99.9 per cent confidence level.

	Present post-1930	**Absent post-1930**
In central hectads	70	131
In outer hectads	164	160

Discussion

This is unlikely to be due to lack of suitable habitats. Indeed there are more walls in cities than outside them! It may be argued that botanical recording in cities is less thorough, and less attractive to the amateurs who are principally responsible for these records, than in the countryside. In fact the evidence of history points to the opposite conclusion, that the relative scarcity of botanical habitats in cities leads those that do exist to be extremely well studied. Certainly the quotation from Britten (1881) cited above shows how eagle-eyed the Victorian fern-hunter was.

This leaves environmental factors. As Page (1997) remarks, the dependence of mural ferns on direct precipitation renders them very sensitive to pollutants. If this is a reason for their long-standing scarcity, the revival of their fortunes in London ought closely to follow the effects of the Clean Air Act of 1956 that dramatically reduced atmospheric SO_2 levels in the capital. In other cities legislation came into effect later. If these ferns have increased elsewhere as they seem to have in central London, it would be interesting to know when this increase occurred, or was first noticed.

One other factor may play a part. The concentration of active nitrogen from anthropogenic sources has increased dramatically, especially in western Europe, where by about 1980 it exceeded the contribution from natural sources (Vitousek 1994). The ecological significance of this has recently been recognized and many studies of its effect on plant communities are now under way. Of course most plants suffer from eutrophication; however some time ago Smith and Robinson (Smith 1979) showed that normal growth in *Polypodium vulgare* was seriously inhibited by nitrogen deficiency. Although this remains one of the few studies of the effects of nitrogen availability on fern development, it suggests the possibility of a compounding effect in those species that are largely dependent on rainwater for their nutrients. The causes of the revival of mural ferns in London may be subtle.

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Hay meadow management treatments compared using a multivariate analysis

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Abstract

Multivariate analysis was used to assess the effects of three management treatments on hay meadow vegetation on a farm. The three treatments were hay harvesting, flail cutting and no cutting. The investigation was undertaken in sixteen meadows of neutral London Clay grasslands at Fryent Country Park, Middlesex from 1985–1996. Frequency data for twenty-one of the more common plant species were used in the multivariate analysis. Seven species were found to be useful as discriminators between management treatments: *Holcus lanatus* Yorkshire fog, *Cirsium arvense* creeping thistle, *Vicia sativa* common vetch, *Poa trivialis* rough meadow-grass, *Arrhenatherum elatius* false oat-grass, *Cerastium fontanum* common mouse-ear and *Lolium perenne* perennial rye-grass. In 82 per cent of the sixteen field × twelve-year cases the treatment that had been applied during the previous year was correctly identified by the discriminant analysis. The results suggested a relationship between the management treatment applied to the neutral grasslands in one year and the type of grassland vegetation present a year later. Of these, hay harvesting was the best for maximizing the plant species richness. Flail cutting was intermediate, whilst no cutting resulted in the lowest species richness.

Introduction

An earlier paper (Williams, Fowler and Jarvis 1999) used a Latin square to investigate experimentally the effects of three treatments employed by local authorities and other landowners to manage grasslands in nature areas. This paper extends that work to investigate the effect of three management treatments on the hay meadows of a farm. Land managers with a remit for nature conservation may need to know how the grassland flora will respond to different management treatments or to changes in treatment (Crofts and Jefferson 1999). Consistency of management treatment is not always possible as the land manager may need to consider financial constraints, the market for hay or silage crops, the availability of equipment, weather, ground conditions and the risk of fires. In some years it may not be possible to harvest the cut material, or even to cut the grassland.

The objectives of this investigation were to compare, on a farm scale, the relationship between the management treatments applied to hay meadows and the resultant grassland vegetation. Three grassland management treatments,

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practised in the Country Park and by other land managers, were investigated: annual hay harvesting, annual flail cutting (i.e. hay cutting with the material left on the ground) and no cutting. Because this investigation was of a countryside situation and not under experimental control, the type of future management treatments and their timing during the investigation could not be anticipated, a problem discussed by Skalski (1990). This suggested the use of a monitoring programme with multivariate analysis of the data.

Methods

Fryent Country Park covers an area of 103 hectares of countryside (Williams and Northcroft 1992), about 15 kilometres north-west of central London. It is surrounded by suburbia and bisected by the A4140 (Fryent Way). Formerly part of the Middlesex countryside, the Park is within the Northern Thames Basin character area and the London Basin natural area (Countryside Commission and English Nature 1996). In altitude, it varies from about 40–86 metres above mean sea level (OD). The Park is owned and managed by Brent Council with the assistance of volunteer and community groups. The whole Park was opened to the public in the 1970s; became a Country Park in 1984 and a Local Nature Reserve in 1991. Management of the Park is for public recreation, nature conservation and landscape heritage. Farmland and woodland cover much of the Park. References suggest that the fields had been farmed primarily as hay meadow and/or as grazed grasslands during recent centuries (All Souls College 1597, Bolton 1971, 1976, Garrett 1935). The hay meadows are now managed organically and have the Soil Association Organic Standard.

Hay meadows used for the multivariate analysis (Table 1) were on the east side of the Country Park, on soils derived from the underlying neutral London Clay (Eocene) and were of Mesotrophic Grassland type MG1 (Rodwell 1992). Individual meadows (fields) were considered as the units for the description of

TABLE 1. Information for meadows used in the investigation. Note that data from Pages field were not used in the multivariate analysis as there was a missing year of data.

Meadow letter	Number	Name	Approx. area (ha)
L	1	Honey Slough East	2.9
M	2	Little Cherrylandes	3.0
N	3	Gotfords Hill	8.3
O	4	Oldefielde Grove	1.4
P	—	Pages	2.8
Q	5	Goldringe strip	0.6
R	6	Richards East	0.8
S	7	Meade East	1.1
T	8	Goldringe	2.0
U	9	Homefield North	0.3
V	10	Homefield	2.5
W	11	Warrens/Blacklandes	4.3
X	12	Warrens East	1.1
Y	13	Little Hillcroach	0.6
Z	14	Great Hillcroach	3.2
Aa	15	Short Down East	3.9
Ba	16	Long Down	1.2

vegetation, rather than mapping of vegetation types within meadows or across field boundaries. The reasons for this were that field boundaries were easy to demarcate, there would be consistency in monitoring from year to year, and it was probable that the whole of each meadow had received the same management treatments in each year prior to and during the investigation. The management treatment(s) applied to each meadow in each year were recorded.

Annual monitoring was undertaken from 1985–96 in each of sixteen meadows to obtain the frequency of the main grassland plant species. Frequency was defined by Curtis and McIntosh (1950) as the number of quadrats in which a species occurs × 100 per cent / total number of quadrats examined. Species richness per square metre was taken as the average number of species per quadrat in each meadow. Shoot frequency was used and species were included as present if their foliage was partially or wholly within the quadrat, whether or not the plant was rooted in the quadrat. Note that 'plant species richness' refers to angiosperm species richness. Bryophytes were recorded where present, but were comparatively minor constituents of the grassland sward.

Ten one-metre square quadrats were used in each meadow, except in the first year, 1985, when twenty quadrats were used per meadow as suggested by Duffey et al. (1974). Ten was a statistically small sample size per meadow, but a balance had to be achieved between the theoretical aspects of sampling and the time available to sample all the meadows within the target dates. Investigations in 1984 had suggested the use of ten quadrats per meadow and size of about one square metre.

The fieldwork was usually undertaken within the target dates of 15–30 June. Smith, Wells and Welsh (1985) recommended standardization to within two to three weeks of a specified date. The greater the deviation from this period, the greater would be the possibility that the composition of the sward would differ from that on the target dates. Too early a survey increased the chance of missing later developing species, whilst too late a survey date increased the chance that a meadow would be harvested before it had been surveyed. Quadrat positions were determined by stratified sampling (Yates 1960), with sampling in each sub-area. Each meadow was divided approximately into ten sub-areas and a marker was thrown in each, avoiding atypical features. The quadrat was placed on the north-west corner of the marker, with the four sides of the quadrat squarely in line with the four main compass points. The species present in each quadrat were recorded. A total of 2,080 quadrats was surveyed (20 quadrats × 16 meadows in the first year; plus 10 quadrats × 16 meadows × 11 years).

The multivariate analysis applied to these data was Fisher's linear discrimination analysis. The objective was to assess if information on the species observed in one year could be used to predict the management treatment used in the previous year. If a satisfactory discrimination rule could be found, a relationship could then be inferred between the management treatment in one year and species richness in the following year. The multivariate analysis utilized the SAS statistical package (SAS Institute Inc. 1988).

The data for analysis consisted of a data matrix with 192 rows (11 years × 16 meadows) and twenty-one columns (species). It was assumed that most of the information required to discriminate between the vegetation types and their relationship to grassland management would be available from the most frequent species (Austin and Greig-Smith 1968). For this analysis, twenty-one species, including all the most frequent but inevitably including those that were infrequent in some years, were selected manually from the monitoring data based on average frequencies in all meadows during the investigation.

Plant names follow, where appropriate, the order in Stace (1997).

Results

The management treatments applied to each meadow during this investigation and in the two preceding years are recorded in Table 2. The treatments were: A — hay harvesting, B — flail cutting, i.e. hay cutting but without harvesting of the crop, and C — no cutting. In 168 of the 192 meadow × year cases, hay harvesting had been applied in the previous year. For the remaining twenty-four meadow × year cases, flail cutting and no cutting had been used on eighteen and six occasions, respectively. Timing of management treatments varied from year to year: hay cutting commenced on 17 July 1983, 18 July 1984, 9 July 1985, 16 July 1986, 10 July 1987, 2 August 1988, 25 July 1989, 24 July 1990, 1 August 1991, 26 July 1992, 23 June 1993, 18 June 1994, 9 July 1995, and 10 July 1996. The length of time before the harvest was complete could also vary depending upon the weather and other factors, but was seldom less than four weeks. For example, in 1988 harvesting continued into September.

TABLE 2. Management of grassland in hay meadows at Fryent Country Park, 1983–1996. Key: A – hay harvesting, B – flail cutting, C – no cutting.

Meadow	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
L	A	A	A	A	A	A	A	A	A	A	B	A	A	A
M	A	A	A	A	A	A	A	A	A	A	A	A	A	A
N	A	A	A	A	A	A	A	A	A	A	A	A	A	A
O	A	A	A	A	A	A	A	A	A	A	A	A	A	A
P	A	A	A	A	A	A	A	A	A	B	B	A	A	A
Q	A	A	A	A	A	A	A	A	A	B	A	A	A	A
R	A	A	A	A	A	A	A	A	A	A	A	A	A	A
S	A	A	A	A	A	A	A	A	A	A	A	A	A	A
T	A	A	A	A	A	A	A	A	A	A	A	A	A	A
U	A	A	A	A	C	A	A	A	A	A	A	A	A	A
V	A	A	A	A	A	A	A	A	A	A	A	A	A	A
W	A	A	A	A	B	A	A	A	A	A	A	A	A	A
X	A	A	A	A	C	B	B	B	B	B	A	A	A	A
Y	A	A	A	A	C	B	C	B	B	C	B	A	A	A
Z	A	A	A	A	B	A	A	A	A	C	B	A	A	A
Aa	A	A	A	A	B	A	A	A	A	B	A	A	A	A
Ba	A	A	A	A	B	A	A	A	A	B	A	A	A	A

Species used in the analysis were *Ranunculus acris* meadow buttercup, *Ranunculus repens* creeping buttercup, *Cerastium fontanum* common mouse-ear, *Geranium dissectum* cut-leaved cranesbill, *Trifolium dubium* lesser trefoil, *Trifolium repens* white clover, *Trifolium pratense* red clover, *Vicia hirsuta* hairy tare, *Vicia sativa* common vetch, *Lathyrus pratensis* meadow vetchling, *Cirsium arvense* creeping thistle, *Lolium perenne* perennial rye-grass, *Poa trivialis* rough meadow-grass, *Dactylis glomerata* cocksfoot, *Bromus hordeaceus* soft-brome, *Bromus commutatus* meadow brome, *Elytrigia repens* common couch, *Arrhenatherum elatius* false oat-grass, *Holcus lanatus* Yorkshire fog, *Phleum bertolonii* smaller cat's-tail, and *Alopecurus pratensis* meadow foxtail. *Agrostis* spp. bent grasses, though frequent, were often difficult to identify in the vegetative state and were therefore not included in the multivariate analysis.

The discriminant analysis was performed stepwise. At the first step the single most important discriminatory variable was found. At the second step the variable was found which, in addition to that found at step 1, most improved the discriminatory process, and so on. Thus at each step the next most important discriminatory variable was found. The process stopped when no further variables significantly improved the discrimination between management treatments (criteria used to assess significance were based on minimizing the overall Wilk's lambda). The analysis was run with the twenty-one species, during which eight were entered though one of these was subsequently removed. Species were entered in the following order: Yorkshire fog, creeping thistle, common vetch, rough meadow-grass, meadow brome, false oat-grass, common mouse-ear and perennial rye-grass, followed by the removal of meadow brome.

The discriminant analysis indicated which species tended to be associated with each management treatment (Table 3). Common vetch and perennial rye-grass were most abundant when hay harvesting was utilized. Species least associated with or absent from the no cutting included common vetch, rough meadow-grass, false oat-grass, and perennial rye-grass. Yorkshire fog appeared to prefer hay cutting and no cutting to flail cutting. Rough meadow-grass showed a preference for flail cutting. Creeping thistle and common mouse-ear were most associated with no cutting and least with hay harvesting.

TABLE 3. Association of species with management treatment, Fryent Country Park, 1985–1996. For any one species, the higher the number the higher the association.

	Management treatment		
	Hay harvesting	**Flail cutting**	**No cutting**
Yorkshire fog	1.640	1.457	1.647
Creeping thistle	0.221	0.260	0.301
Common vetch	0.004	- 0.013	- 0.031
Rough meadow-grass	0.139	0.183	0.0719
False oat-grass	0.112	0.117	0.058
Common mouse-ear	- 0.041	0.003	0.019
Perennial rye-grass	- 0.039	- 0.051	- 0.095

The usefulness of any discriminant function is based on the number of cases the discriminant function correctly predicts. Table 4 gives the error rates associated with the discriminant function. Of the total 192 meadow × year combinations, 158 (82 per cent) were correctly classified; 146 of the hay harvested cases, 8 of the flail cut and 4 no cutting meadows. These results appear to show a relationship between the management treatment applied to the neutral grasslands in one year and the vegetation present a year later.

Of the thirty-four meadow × year cases that were incorrectly classified, the majority were in the three years 1994 (7), 1993 (6) and 1988 (6). For 1988, the misclassifications followed single year changes in the management of several meadows in 1987, and in which the analysis tended to continue to classify meadows as hay harvested when in reality they had been flail cut. The misclassifications for 1993 and 1994 were more difficult to interpret.

TABLE 4. Classification of cases by linear discrimination analysis as compared with management records, Fryent Country Park, 1985–1996.

Recorded group	**No. of cases**	**Predicted group membership**		
		A	**B**	**C**
A	168	146 87%	14 8%	8 5%
B	18	8 44%	8 44%	2 11%
C	6	1 17%	1 17%	4 67%

Key: A – hay harvesting; B – flail cutting; C – no cutting.

For the meadows, misclassifications tended to be more frequent where the management had changed throughout the investigation, in particular the three adjacent meadows of Little Hillcroach (5), Great Hillcroach (4) and Warrens East (3). The misclassifications for Long Down (5) were difficult to interpret.

As between the management treatments, several of the misclassifications were acceptable, as they were in meadows which had received two or more different treatments in one year, either at different times or in different parts of the meadow. In such cases, the management code that was entered for the analysis was an approximation to the varied treatments practised and noted in the meadow records. In some other cases, the analysis appeared to classify the grassland as if for the management preceding the year before last, suggesting that the flora could take more than one year to respond fully to a new or changed treatment. Less easy to interpret, as for three meadows in 1994, were misclassifications of hay-harvested meadows as being not cut, especially in meadows without a history of a no cutting treatment.

Species richness per square metre was highest in the meadows that were hay harvested in the preceding year and lowest in the meadows that had not been cut. For example, averages for the three treatments were calculated across the seven years (1988–1994) following years in which a variety of treatments were applied to the meadows (1987–1993). For the hay-harvested meadows the species richness per square metre was 9.24, for the flail-cut meadows it was 8.08 and for the uncut meadows it was 6.07. There was evidence that when hay harvesting was resumed on meadows that had been flail cut or not cut, the species richness increased to a value nearer that of the averages for hay-harvested meadows. Thus the management applied to a meadow within any one year appeared to have an effect on the species richness recorded in June to July of the following year.

Discussion

The multivariate analysis of the data was capable of identifying the management applied during the previous year from the vegetation present in 82 per cent of cases, although it should be noted that there were relatively small sample sizes for the flail cutting and no cutting treatments. This suggested a relationship between the grassland type present and the management treatment applied during the previous year.

Austin and Greig-Smith (1968) suggested that the most abundant 25 per cent of species could provide the maximum information for an efficient ordination. For the analysis reported above, seven species proved useful to the analysis, despite an initial manual screen that had selected only the twenty-one species that were most abundant in the meadows. Not all of the variation encountered in the vegetation was due to the management treatments. Over the twelve years of the investigation, there were also fluctuations in species due to successional factors, for example the increase of false oat-grass. Fluctuations from year to year, irrespective of management treatment or vegetation type, suggested climatic factors (Williams and Fowler 1997). The dry/warm conditions of the late 1980s/early 1990s (Brown 1992) appeared to be responsible for the higher frequencies of the annual legumes.

Species richness appeared to decrease in meadows that were not cut. Much of the reduction occurred in the first year following the change in management. Species richness also declined in meadows that were flail mown without harvesting of the hay, though the reduction was less than in meadows where cutting ceased. The effects of the three management treatments on the species richness of the sward, and on individual species, were similar to the results obtained from a Latin square experiment undertaken at the same site (Williams, Fowler and Jarvis 1999). That investigation suggested that where grasslands are managed to maximize the plant species richness, flail mowing was a near substitute for hay harvesting when circumstances did not permit the harvesting of hay in one or more years. Parr and Way (1988) suggested that there was not always a large difference in species richness between vegetation types resulting from flail cutting and no cutting treatments. However, there could be changes in the relative frequencies of individual species.

For the association between management treatment and individual species, there was general agreement with the literature. However, for the flail cutting and no cutting treatments, the discriminant analysis had a limited number of cases available to show the association with individual species. The response of individual species would therefore be better investigated by other means, particularly where the effects of applying the same treatments consistently over several years are under investigation. Perennial rye-grass and rough meadow-grass preferred the hay harvesting treatment, while creeping thistle preferred no cutting. Common vetch appeared to prefer cutting once annually. False oat-grass appeared to show a preference for flail cutting in this investigation, whilst the Latin square investigation (Williams, Fowler and Jarvis 1999) found that there was no difference between the three treatments. However, see Parr and Way (1988) for the effects on species of increasing the number of cuts within a year.

There are implications for grassland management if grassland communities respond to different treatments applied during the previous year. On the one hand there may be opportunities to restore vegetation types, but there is also the potential to lose a vegetation type within a few years under inappropriate management. Bacon (1990) pointed out that departures from the traditional management of a site should not be made without reason, since distinct botanical and invertebrate communities develop in relation to particular management regimes. Morris (1990) considered that while there may be good reasons for maintaining a historic or traditional system of management, those should be assessed against the needs of wildlife conservation rather than simply copying agricultural systems. Jones-Walters (1990) argued the use of decision analysis for grassland management on nature reserves as this would encourage the feedback and effective decision making required for a more holistic systems approach to management. For example, decision analysis may highlight those management options that are practically feasible, rather than the ideals enshrined in a management plan but which are not possible due to technical or financial constraints. At Fryent Country Park high frequencies of creeping thistle monitored in June/July have enabled decisions to flail cut the aftermath in individual meadows later in the year. Similarly, the apparent efficiency of flail cutting in preserving plant species richness has given the land managers the confidence to undertake that treatment in meadows or during years in which it has been difficult to obtain resources for hay harvesting.

Hay harvesting was used by the local authority, partly because the grass was cut by a contractor at little or no cost to the land owner, while achieving wildlife, landscape and visitor recreation objectives. Problems arose, however, in years when wet weather prevented the harvesting of the cut vegetation or if meadows were left uncut. In practice, the financial difference between cutting, and cutting with collecting, is not insignificant. For example, the prices quoted to Brent Council in its grounds maintenance contract are several times more expensive for cutting with collection of the cut material, as compared with cutting only. However where a crop is cut and harvested for economic use, the cost to the land manager is low.

Acknowledgements

Dr M. B. Usher of Scottish Natural Heritage provided helpful comments. Dr G. Murray of De Montfort University provided assistance with the multivariate analysis. Fryent Country Park, the site of the investigation, is owned and managed by Brent Council with the support of the volunteers of Barn Hill Conservation Group. Thanks are due to Elvis Johnson-Idan and Shaun Faulkner, respectively past and present managers of the Brent Council Parks Service. R. M. Burton of the London Natural History Society identified some plant material. Recently, Simon Mercer of the Brent Group of London Wildlife Trust advised on the meadows database, and the Millennium Commission provided grant aid through the British Trust for Conservation Volunteers.

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Book review

The British potter and mason wasps. A handbook. Michael E. Archer. Vespid Studies. 2000. 96 pp., A5, paperback, wirebound. ISBN 0 9537992 9 8. £5 post free from Vespid Studies, 17 Elmfield Terrace, Malton Road, York YO31 1EH. Cheques payable to M. E. Archer.

I imagine that I am rather typical of many BWARS members. I have a great interest in bees, wasps and ants, but the interest outweighs the ability, considerably. I am somewhat daunted by a lack of keys that are both easy to use **and** give the right answer. Furthermore, when I have finally got the right answer, I am often frustrated by the need to wade knee-deep through the literature in order to find out about the ecology, distribution and other aspects of the beast — seldom are all these items contained in a single publication.

Mike Archer's new book sets all that right, at least as far as the British Isles Eumeninae are concerned. A general introduction leads to a synonymic checklist. This only includes synonyms used in the British literature, omitting several European ones, but at least it makes sense of some of those peculiar old names on the Recorder database! There follows discussions on habitats, nesting, brood development, prey species, phenology, parasitism and flowers visited — all rather brief, but splendidly precise and accurate. An article on the rare species *Pseudepipona herrichii* by Stuart Roberts and George Else, reproduced from *British Wildlife*, is interesting, even if somewhat out of place in a general guide to the group (there are species mapped in the work with less dots on the map than this one).

After this aperitif, we arrive at the main course — the keys. These are introduced by paragraphs on recognizing a eumenine wasp (always useful to know one is using the right key), collecting, killing and mounting. Read the bit on mounting if you want to stand any chance of identifying wasps correctly! The keys are simple and are illustrated with good, clear drawings presented alongside the words, so it is not necessary to flip back and forth all the time. I tested out specimens of *Odynerus melanocephalus* (X), *Microdynerus exilis* (X), *Ancistrocerus parietinus* (XC), *Symmorphus connexus* (X), *S. gracilis* (XC) and *S. bifasciatus* (C) from my own collection and these all ran to the correct answer first time without any problem. Two of the eight whole insect drawings that follow the keys feature two of my test species and I was pleased to discover that my test specimens actually look like the pictures — always a comfort!

Dessert takes the form of species accounts. These contain a wealth of important and useful information, including a distribution map (for those interested, nine of the twenty-two British species, 41 per cent, get close enough to Dr Archer's doorstep to warrant him getting his net out). There is also information on flight period (for species where there are at least fifty-five records), resource needs and status.

After this three-course meal of a booklet, cheese and biscuits are represented by a useful list of references occupying six pages.

This is not a major scientific treatise; it is a practical and very valuable summary of knowledge aimed at the likes of you and me, and at a sensible price. If I had not the good fortune to be in receipt of the free review copy, I would have already posted off my cheque to buy one.

COLIN W. PLANT

Limpsfield Common revisited — the birds compared after six decades

P. J. OLIVER

The Briar Patch, Limpsfield Chart, Oxted, Surrey RH8 0TL

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Abstract

Breeding season and winter surveys of the birds of Limpsfield Common were carried out in 1999 and compared with surveys carried out between 1937 and 1940. Comparison is also made with data from Bookham Common. Twenty-nine species were found in the breeding season compared with fifty-nine in the earlier surveys. Twenty-two species have either become extinct or much reduced and only three or four have increased. Comparison between the winter surveys is less reliable, but there has been a large increase in the woodpigeon. There were more gains and fewer losses at Bookham Common. Lack of management directed at maintaining a diversity of habitat is suggested as an important reason for the impoverishment of the avifauna on Limpsfield Common.

Introduction

From 1936 to 1943 the Ecology Section of the London Natural History Society conducted a survey of Limpsfield Common in Surrey, but from 1942 turned its attention to the survey of Bookham Common still in progress today. The published results of the Limpsfield Common survey were principally a vegetation survey and map (Castell 1939) and papers listing species recorded. These included five on the birds (Currie 1938, 1939 *a, b,* Parmenter 1940 and Parmenter and Fitter 1941). So far as I am aware, nothing specifically relating to the ornithology of the Common has been published since, so it seemed of interest to repeat the surveys of some sixty years ago to see what changes might have occurred. This paper reports the results of two short breeding-season surveys of birds carried out in April and May 1999 and two winter surveys in November and December of that year, together with a review of the differences in vegetation cover between 1938 and 1999. These are contrasted with the original surveys and comparison is also made with breeding-season changes in birds reported over a similar period from Bookham Common.

Study area and habitat changes

Limpsfield Common, at an altitude of between about 140 m and 157 m, lies on the summit of the Lower Greensand ridge south of the village of Limpsfield, Surrey. A map of the area, showing the sectors into which the Common was divided for the purposes of the 1999 surveys forms Figure 1. It is worth repeating the original description of the Common at the start of the survey in 1936 (Parmenter and Thomas 1937):

> 'The area is just over 200 acres [about 81 hectares], which consists of a greensand common with gorse, bracken, heather-and-grasslands, several trees, thickets, and small wooded patches, and a 19 acre [about 7.7 hectares] wood of oak, holly and beech. There are also a few permanent pools and old sand-pits.'

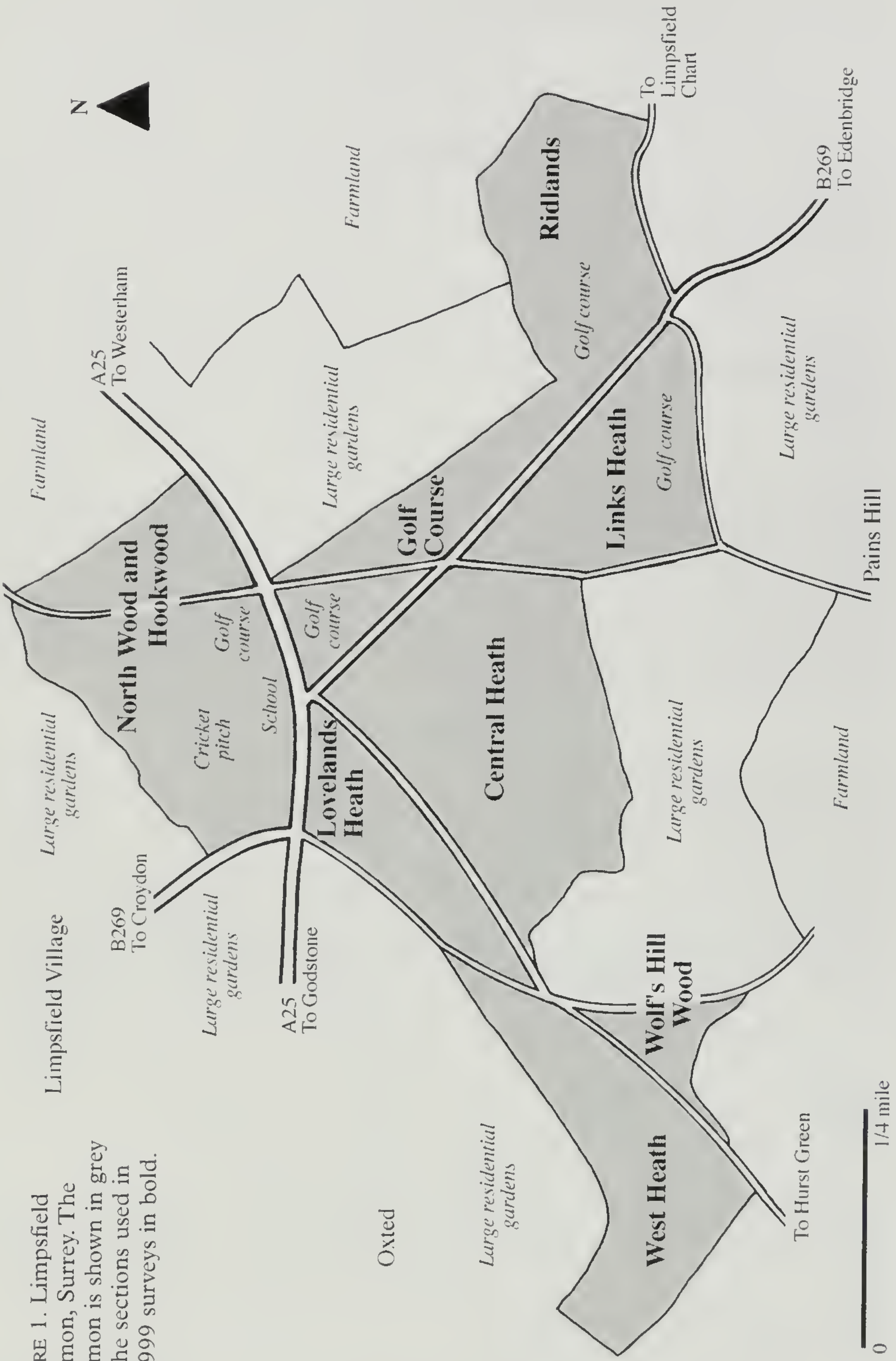

FIGURE 1. Limpsfield Common, Surrey. The Common is shown in grey and the sections used in the 1999 surveys in bold.

Today the Common is predominantly secondary woodland of birch* and oak with some beech and sycamores. Holly is now widespread in some areas and rowans are well distributed. The ponds have disappeared, the sand-pits have vanished beneath tangles of vegetation, including trees, and gorse and heather barely justify a mention. Bracken occurs widely and, apart from the golf course and cricket pitch (both established long before the first surveys) which lie within the boundary of the survey area, grassland is limited to a few small patches. Thus the open landscape that existed sixty years ago has been transformed predominantly into woodland, principally by the all-pervading birch. The only constant features are the continued existence of the original woodland in Ridlands at the eastern end of the area, stands of pine and beech in Hookwood and North Wood at the northern edge and the grassland of the golf course and cricket pitch. As in 1936, the Common is adjoined on all sides by mostly large houses and well-established gardens, but there appears to have been no encroachment by buildings over the intervening years. A more detailed description of the changes and recent management actions appears in Appendix 2, whilst Figures 2–4 illustrate three of the areas.

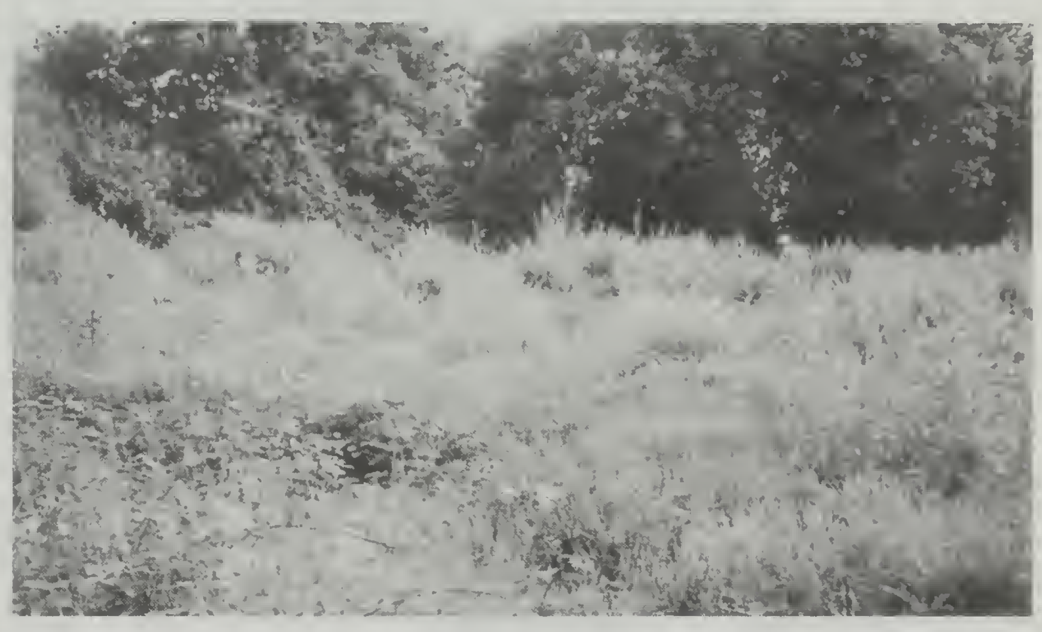

FIGURE 2. West Heath, with dense regenerating birch, August 1999.

The original heather and gorse areas were maintained by grazing and burning. Grazing ceased in the mid 1920s (National Trust 1997). Rabbits were quite abundant at the time of the earlier surveys (Harrison 1943) and their presence would have helped maintain an open landscape, but at the present time they do not appear to be particularly numerous on the Common (pers. obs.). From 1935 a local committee was responsible for management which included cutting bracken and burning heather (Robbins 1938). Since 1972 the Common has been in the ownership of The National Trust. From that time, management has consisted mainly of clearance of paths and verges and replanting of woodland lost in the storm of October 1987 (R. Reed, pers. comm.). Two areas have been cleared and bracken sprayed in an attempt to restore heather. One of these (West Heath) was successful, but birch and bracken both outgrow the heather and require repeated cutting and spraying. No heather regeneration occurred in the second area (Lovelands Heath).

Figure 1 shows the extent to which the Common is split up by roads. These include the now constantly busy A25 and the B269 to Edenbridge, but all of the

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*Scientific names are given in Appendix 1.

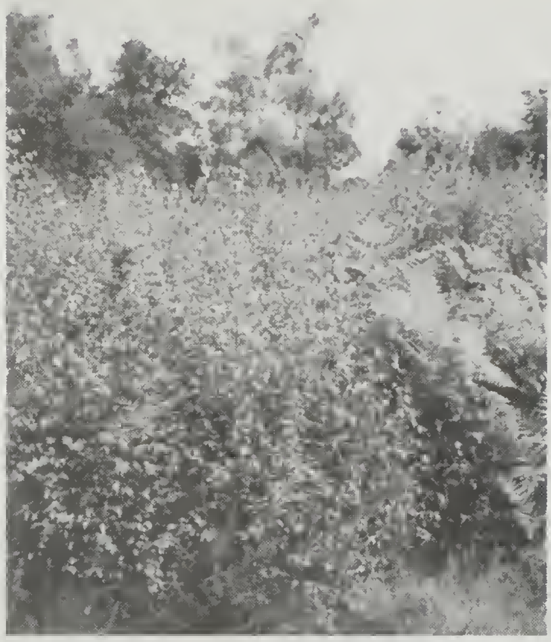

FIGURE 3. Lovelands Heath was cleared several years ago to encourage heather but is now entirely birch. August 1999.

other roads are well used, especially during weekday rush hours. Robbins (1938) refers to horse-riding and use by visitors at weekends, especially from May to September near the A25 and B269. Today the Common is heavily used in most areas by dog walkers and others daily throughout the year. Whereas in the past dog walkers were doubtless local residents, today people drive regularly from further afield to use the Common and there can be no doubt that disturbance by people and dogs is now much greater than in the past. The Greensand Way long-distance footpath runs across part of the Common and there is some mountain-biking, but the ownership by The National Trust has limited the more invasive forms of recreational activity.

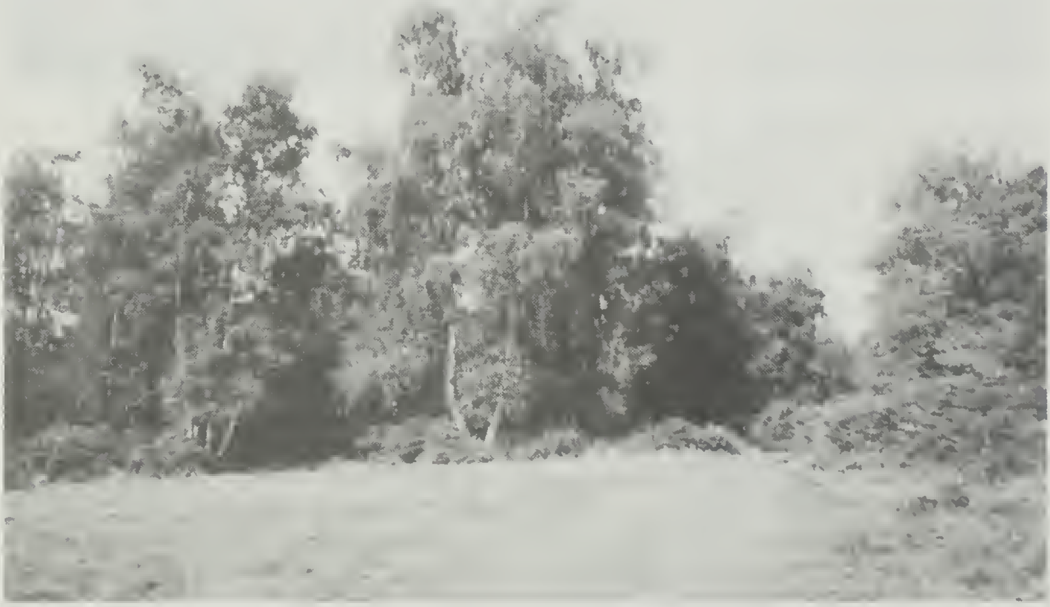

FIGURE 4. Central Heath, with one of the few open areas. August 1999.

Methods

No information was given on the observations supporting the preliminary list of birds (Currie 1938). The breeding season list for 1938 (Currie 1939*b*) was clearly based on the records of a number of observers over the season. That for 1940 (Parmenter and Fitter 1941) took place on 7 April and was made by ten observers in three parties between 11.30 and 15.30. It was timed specifically to be before the arrival of most summer visitors. The original surveys differed from the mapping technique used by the BTO's Common Birds Census which attempts to record the majority of territorial males (Marchant 1983) and for consistency I did not therefore use this technique. Instead, in spring 1999 I walked a route across each section of the Common such that I had a reasonable chance of hearing any birds singing and recorded all birds seen or heard. In the first survey I covered the Common on two days, partly between 08.15 and 09.50 GMT on 21 April, with the remainder on the following morning between 08.20 and 09.14 GMT. I covered the whole of the Common again on 3 May in a single visit between 08.00 and 10.15 GMT. I kept separate records for each section of the Common and, because of the unlikelihood that I recorded all birds present on a single visit, I took the highest count for each sector on either of the survey dates as being the most appropriate measure of the population. It is likely that these counts included some migrants that were passing through the area, but it is also likely that, even on two visits, I missed some birds, so these two sources of potential error may have counteracted one another (though to an unknown extent). I visited most parts of the Common again on 14 June to check for species expected but not found in the earlier visits and any late summer visitors, but without making a full survey. This visit added nothing to the earlier results.

The Ecology Section conducted two winter censuses. The first, on 4 December 1938 (Currie 1939*a*) did not quite cover the whole area; it was conducted between 10.30 and 16.00 by five observers operating in two groups. The second, on 3 December 1939 (Parmenter 1940), was complete and was carried out between 10.45 and 13.00 by nine observers working in four parties. On 30 November 1999 between 09.25 and 11.40 GMT I followed a similar route to that used in the spring. I made a second survey on 18 December between 12.25 and 13.55 GMT, but this was incomplete as I did not visit Wolf's Hill Wood or Hookwood and North Wood.

In assessing the results I have taken into account the known present status of birds on Limpsfield Chart, which lies to the east of the Common, has similar habitat and which I have studied extensively since 1980. I have also taken into account my knowledge of the birds of the agricultural land that lies immediately to the south of both the Common and the Chart and which I have also studied over a similar period. Together, this agricultural land and the Chart are referred to as 'the District'.

Results

The breeding season

The results of the 1999 spring surveys are set out in Table 1 in comparison with a summary of the breeding season reports from 1937 and 1938 and the survey of 1940. When comparing data from the different years, it must be borne in mind that the methods used in each survey were different, that the 1940 survey excluded most summer visitors and that the earlier results were the work of a number of observers, whereas those for 1999 involved only one. Direct comparisons of reported numbers therefore require care in interpretation. Nevertheless, there are some striking differences between the surveys, notably in the number of species recorded — fifty-nine in aggregate in the earlier ones compared with only twenty-nine in 1999. Comments on selected species follow. The results are assessed in a national context principally in the Discussion.

Table 1. Birds in the breeding season at Limpsfield Common, Surrey. See text for sources.

	1937	1938	1940	1999
Kestrel	Occasional over			
Grey partridge	Traces found			
Stock dove			3	2
Woodpigeon	Common; several bred	Several pairs	1	18
Turtle dove	One or two pairs	Four nests found, possibly two other pairs		
Cuckoo	One in May	Adult seen twice, newly fledged young once		
Little owl			1	
Nightjar	One pair	Probably two pairs		
Swift	Only in July			
Wryneck	Seen several times	One pair on Common, another just off		
Green woodpecker	Not uncommon	One pair may have bred, another did so just off Common		1
Great spotted woodpecker	Occasional	One pair probably bred	1	2
Lesser spotted woodpecker			2	
Skylark	Probably bred	Probably did not breed		
Sand martin	Colony of about five pairs	Probably did not breed		
Swallow	Occasionally over			
House martin	As above, but less common			
Tree pipit	A few pairs	Four pairs		
Pied wagtail	Occasional			4
Wren	Common	Fairly abundant	6	53
Dunnock	Fairly common	One nest, eight singing	16	6
Robin	Very common	Abundant	44	57
Nightingale	One pair	Three pairs		
Redstart				1
Blackbird	Very common	Abundant; 17 nests found	47	30
Song thrush	Very common	Abundant; 17 nests found	7	7
Mistle thrush	Common	Five pairs	1	1
Lesser whitethroat	Singles May and June	One pair		
Whitethroat	Only on West Heath	One brood, three other singing males		
Garden warbler	Six to eight pairs	One nest, seven other singing males and two more just off Common		1

	1937	1938	1940	1999
Blackcap	Six to eight pairs	One brood, five other singing males		12
Wood warbler	Four pairs	Two to three pairs probably bred		
Chiffchaff	Fairly common	One nest, seven other singing males	16	13
Willow warbler	Common	Four nests, 11 other singing males	4	8
Phylloscopus sp.			3	
Goldcrest		Several pairs may have bred	6	8
Spotted flycatcher	Possibly bred	One pair bred off Common; up to four may have bred on Common		
Long-tailed tit	One or two pairs bred	One to three pairs	5	4
Marsh tit	Not uncommon	Probably not breeding	2	
Willow tit	Not June–October	Two to four pairs	4	
Coal tit	Not uncommon	One pair probably bred	12	6
Blue tit	Common	Breeds in all suitable areas	36	58
Great tit	Fairly common	Breeds in all suitable areas	22	23
Nuthatch	Occasional; more often in adjoining gardens			4
Treecreeper	One or two seen	May breed in three areas	8	
Red-backed shrike	Probably two pairs bred	Probably seven pairs bred		
Jay		Two pairs bred	4	4
Magpie	Twice			12
Jackdaw	Occasional	Used to breed in quarry, but not since 1935		4
Rook	Breeds just off Common			
Carrion crow	Occasional			9
Starling	Feeds in area	Several pairs bred	2	
House sparrow	Occasional at edges adjoining houses		8	
Chaffinch	Fairly common	Ten singing	39	15
Greenfinch			3	1
Goldfinch	Several May–September	One pair probably bred just off Common		
Linnet	Breeds commonly	Many pairs bred, all in gorse		
Redpoll	Probably breeds in gardens, not on Common		4	
Bullfinch	Several pairs resident	Two or more pairs bred	13	5
Hawfinch	Two nests	Two or more pairs probably bred	3	
Yellowhammer	A few pairs breed	One pair bred, possibly two others	6	

Turtle dove. This is now a scarce and erratic visitor to the District, so its absence in 1999 was not unexpected.

Cuckoo. Although not recorded in 1999, this species may still occur as some are present in the District each spring.

Nightjar. Although I did not visit the Common at dusk, it seems unlikely that this species still nests there (though in recent years it has begun nesting again on Limpsfield Chart). It does not usually nest in areas of suitable habitat of less than a hundred hectares (Moore and Hooper 1975) and is known to be susceptible to human disturbance (Cramp 1985).

Wryneck. Its absence reflects its extinction nationally as a breeding species.

Skylark and **sand martin**. The habitat is now unsuitable for both species.

Tree pipit. It seems that this species no longer nests on the Common, even though parts still appear suitable and a few pairs still nest on Limpsfield Chart.

Pied wagtail. Those seen in 1999 were feeding on the golf course. It was not clear whether they were local breeders or not.

Wren. The very small number counted in 1940 was presumably the result of the low temperatures experienced in January that year. It was the third most numerous species in 1999 and is clearly still very common.

Dunnock. It is difficult to say whether this species has declined or not; it could today hardly be described as common, as it was in 1937. Many fewer were counted in 1999 than in 1940, but there is not obviously a significant difference between the records for 1938 and 1999.

Nightingale. Evening or night-time visits might have revealed this species in 1999 as it still occurs in the District in some years, but it is at best a very scarce species and is certainly no longer the common species in Limpsfield and Oxted described by Robbins (1932) and Dear (1932).

Redstart. The appearance of a singing male on 3 May 1999 seems likely to have referred only to a passing migrant. It could not be found subsequently.

Blackbird and **song thrush**. Although the status of these two species was apparently very similar to one another in both 1937 and 1938, many more blackbirds than song thrushes were counted in 1940, as was also the case in 1999. It is uncertain whether the blackbird has declined, though on the evidence of the 1940 and 1999 counts that seems possible. The song thrush could not today be described as either 'very common' or 'abundant' and it seems likely that it is now less numerous than in the past.

Mistle thrush. Compared with 1937 and 1938 it appears that this species too is now less abundant. The fact that only a single bird was counted in 1940 may be attributable to the hard weather in the preceding winter.

Lesser whitethroat. This has evidently always been scarce on the Common, but it has declined sharply in the district in recent years.

Whitethroat. This is now scarce in similar habitat on Limpsfield Chart whereas it is reasonably numerous in the hedgerows of the neighbouring farmland. Probably the habitat on both the Common and the Chart is now too wooded for it.

Garden warbler. The single singing male in 1999 was at the eastern edge of the Common, close to the Chart where it is a regular breeder. None was singing on my June visit when several were still in full song on the Chart. There seems little doubt that it has declined since the earlier surveys.

Blackcap. The growth in the number of trees that have invaded the common land and the consequential structural change in the habitat has presumably aided the apparent increase in this species.

Wood warbler. This is now of only irregular occurrence in the District so its absence in 1999 was not surprising.

Willow warbler and **chiffchaff**. If the habitat changes have benefited the blackcap, then the converse may be true of willow warbler which now appears to be less numerous than in the past. The chiffchaff has probably maintained its numbers. Given the increase in woodland, however, it might perhaps have been expected to have become more numerous.

Spotted flycatcher. This species has declined sharply as a breeding species in the District, so its absence on the Common was not unexpected. A pair had, however, been reported nesting on the edge of the Common in 1997 and 1998 (K. C. Osborne pers. comm.).

Marsh tit and **willow tit.** The records for 1937 and 1938 suggest that neither species then bred regularly, though it seems that neither was uncommon. Both are now extremely scarce in the district.

Nuthatch and **treecreeper.** The nuthatch may have increased, perhaps aided by the more extensive woodland. The treecreeper is an inconspicuous species in the breeding season and could easily have been missed in 1999. Osborne (pers. comm.) saw one on the Common in April 1999. It is reasonably common elsewhere in the District.

Red-backed shrike. Seven pairs in 1938 is a sobering reflection of the fortunes of this now nationally extinct species.

Crows. There can be little doubt that both **carrion crow** and **magpie** are now much more numerous than sixty years ago.

Starling. In this District the starling only breeds commonly in and around houses and farmsteads. Although parts of the Common contain mature trees likely to provide suitable nesting holes, it is doubtful if it any longer nests on the Common itself.

House sparrow. This is now rare, or perhaps completely absent, in adjoining gardens.

Chaffinch. As with the blackbird, the 1999 counts are consistent with the subjective assessments for 1937 and 1938, but are much lower than the count for 1940. It is not clear, therefore, whether the abundance of this species has changed.

Linnet. While most of the gorse favoured by this species in 1937 and 1938 has now been swamped by woodland, some areas still appear suitable for it. In the past few years it has ceased to breed on the Chart (which also still contains apparently suitable habitat) and has also become much less numerous on the farmland. It seems that it is probably now lost as a breeding bird on the Common.

Hawfinch. So far as I am aware this species has not been resident in the District for a decade or more and has plainly suffered a sharp reversal since the earlier surveys.

Yellowhammer. The habitat is now mostly unsuitable with insufficient open spaces for this species. It still occurs on the Chart but was thought to have declined on the adjacent farmland in the early 1990s (Oliver 1994).

Winter

The number of individuals of each species counted in each winter survey is given in Table 2. Whereas a single observer, working on more than one date in the breeding season is likely to record a high proportion of singing (and thus potentially breeding) birds, a single visit in winter when many species are silent is likely to miss a significant number of individuals. Also, the procedure of taking the highest count for each sector obtained on either visit is probably not valid in winter (and in any case did not significantly alter the totals for most species when applied to the current surveys). The 1999 surveys are thus unlikely to have been as complete as the two earlier ones, each involving several observers. A comparison between the two earlier surveys shows very marked differences for some species that seem more likely to be accounted for by individuals missed than by genuine changes in the population (e.g. dunnock and bullfinch). For these reasons, conclusions about the changing fortunes of species in winter based on these surveys can only be tentative. Nevertheless there are some surprising variations in the counts of some species that warrant comment.

Woodpigeon. On the basis of the figures in Table 2 there can be no doubt that this is now a much more abundant species on the Common than in the 1930s. In 1999, although some were feeding on the ground, often below hollies, many flocks were loafing in tall trees. This is a frequent habit of this species on the adjacent farmland as flocks rest between bouts of feeding on the fields. Probably those on the Common are part of the population that feeds on this agricultural land. If that is so, the increase might be related to any changes in agricultural practices that have occurred, as fluctuations in woodpigeon numbers in East Anglia have been shown to be closely related to changes

TABLE 2. Birds in winter at Limpsfield Common, Surrey. See text for sources. 1999 counts on 30 November and, in ( ), 18 December (incomplete).

	1938	1939	1999	
Sparrowhawk			1 or 2	
Pheasant		1		
Woodpigeon	3		229	(205)
Green woodpecker	1	1	1	(1)
Great spotted woodpecker			3	(2)
Meadow pipit	3	9		
Pied wagtail			2	
Wren	26	18	12	(5)
Dunnock	20	5	2	(1)
Robin	26	32	18	(7)
Blackbird	73	76	23	(21)
Fieldfare				(1)
Song thrush	7	9	3	(2)
Redwing	9		40	
Mistle thrush	11	9	1	
Goldcrest	19	9	8	(1)
Long-tailed tit	17	26	32	(17)
Marsh tit	2	5		
Willow tit	6	sp. 4*		
Coal tit	1	3	4	(1)
Blue tit	38	41	27	(10)
Great tit	17	12	18	(7)
Nuthatch		1	2	
Treecreeper	1	2		
Jay	2	4	12	(10)
Magpie			4	(7)
Jackdaw			4	(2)
Rook	1	12		
Carrion crow		1	20	(9)
Starling	2	1		(2)
House sparrow	23	18		
Chaffinch	25	20	5	(5)
Greenfinch	1		2	
Goldfinch	2			
Redpoll	15	4	4	
Bullfinch	33	4	7	
Hawfinch		1		
Yellowhammer	1			

* Marsh or willow tit (Parmenter 1940: 31).

in agricultural crops (Inglis et al. 1990). I have no data on local cropping regimes against which to test this, though there is doubtless less grazing and more arable now than in the past.

Great spotted woodpecker. Although not recorded in the two earlier surveys it was present in the breeding season in those years (Table 1). On the evidence of the winter (but not the summer) surveys it seems probable that it is now more numerous than sixty years ago.

Meadow pipit. The habitat is now almost entirely unsuitable for this species.

Dunnock. Very few were seen compared with the breeding season in both 1939 and 1999. The sharply lower numbers in the former year compared with the 1938 survey (which was thought to be an underestimate) were noted at the time. Although it was suggested that greater public usage and bracken clearance might have resulted in fewer birds generally, no specific explanation for the lower numbers of this species were offered (Parmenter 1940). It may be that relatively low numbers at times in winter are simply a reflection of the frequently skulking behaviour of this species.

Robin and **blackbird**. The lower numbers in 1999 seem as likely to be attributable to only one observer counting as to any real change.

Song thrush. Currie (1939*a*) commented on the virtual disappearance of this species from the Common in winter. The proportion of song thrushes to blackbirds counted in all four surveys was roughly similar, suggesting that, unlike in the breeding season, the winter population of the song thrush has not changed any more than that of the blackbird.

Redwing. Those in November 1999 were almost all feeding on holly berries. By December the berries had all been consumed and the redwings had gone (though still present elsewhere in the district).

Goldcrest and **tits**. Counts of these species are dependent on whether observers make contact with roving mixed flocks. Apart from the expected absence of **marsh** and **willow tits** in the current surveys and the fact that 1999 was evidently a good year for **long-tailed tits** (following several mild winters) no firm conclusions can be drawn.

Crows. Jays were very obvious in 1999, many individuals collecting acorns. It is possible that the two earlier survey years were poor acorn years, which could explain the low numbers then reported. The prominence of **magpies** and **carrion crows** in 1999 reflects the increase in the breeding season.

House sparrow. The absence of this species in the current survey surely reflects a real reduction.

Chaffinch. Even allowing for the probability that the current surveys were less effective than the earlier ones, this species was remarkably scarce in 1999. This contrasts with no clear change in breeding season numbers, so it seems that this species may now leave the Common in winter.

A breeding-season comparison

I am aware of no long-term studies going back as far as the 1930s, but an obvious and relevant comparison, covering a very similar period to that now available for Limpsfield Common, is with the Ecology and Entomology Section's survey of Bookham Common. Comprehensive breeding-season data are available from as early as 1942 and 1943 (Carrington et al. 1944) and, most recently, for 1997 (Prowse 1998). For consistency with the information from Limpsfield Common I have ignored the many intervening reports, but have taken account of more recent data in Prowse (1999) together with further information provided by Prowse (pers. comm.). There appear to be no comparable winter data.

The survey area at Bookham consists primarily of a mature oak wood on damp clay soil and adjacent common land with shrubs and grass. There are also a number of ponds that, unlike those on Limpsfield Common, have survived until the present day. Also, in contrast to Limpsfield Common, recent management at Bookham has been directed primarily at improving the habitat to maintain and improve biodiversity. See, for example, Swinney (1989) and subsequent annual reports in *The London Naturalist*. A detailed map of the survey area was published with *The London Naturalist* for 1974 (Sandford 1975).

Ignoring water birds and species occurring only at the edge of Bookham Common (where the habitat is rather different), forty-nine species were recorded nesting at Bookham in 1942 or 1943 and 1997. Of these, fifteen showed evidence of increase, three species were apparently gained (tawny owl, a somewhat surprising absentee from the earlier period, pied wagtail and goldcrest) and nine lost (wryneck, skylark, tree pipit, meadow pipit, lesser whitethroat, wood warbler, spotted flycatcher, red-backed shrike and rook). Apart from meadow pipit and rook, neither of which was recorded breeding at Limpsfield in the earlier period, all these species also disappeared from Limpsfield. The remaining twenty-two species showed no good evidence of change at Bookham. Compared with the reductions found at Limpsfield, the picture is thus one of comparative stability with increasing populations of many species and more limited losses. Details of the species concerned are given in Appendix 3 and comments on selected species follow. Because the data in both Prowse (1998) and Carrington et al. (1944) are not always quantified, and when they are, this is not always on a consistent basis, these comments are at times somewhat generalized.

Doves. There may now be fewer **stock doves** (minimum of two pairs compared with 'less frequent than **woodpigeon**'); the latter was described as 'common' in both 1942 and 1997. In contrast to the situation on Limpsfield Common, **turtle doves** have held their own – 'fair numbers' in 1942 and *c.*14 pairs in 1997 (though only five pairs in 1998).

Cuckoo and **woodpeckers.** The published data are inconclusive, but there is neither a clear decline in cuckoo, nor any obvious change in **green woodpecker**. In the case of **great spotted woodpecker**, Prowse (pers. comm.) estimated 25–50 pairs in 1999, a massive increase from 'three to four pairs' in 1942. In that year there were one to three pairs of **wrynecks**, but none in 1997.

Skylark and **pipits**. In the earlier period there were probably three pairs of skylarks and nine song posts of **tree pipit**, while **meadow pipit** was described as 'rare in breeding season'. All have now been lost as breeders.

Wren, **dunnock** and **robin**. The data for 1997 are mostly unquantified for all three species, which clearly were, and remain, reasonably numerous to common. In view of the possibility of a decline in the dunnock at Limpsfield Common, it is of interest that eleven song posts were recorded for this species at Bookham Common in 1942, whereas it was described as 'widespread' in 1997 when a total of 37 individuals was present. Prowse (pers. comm.) estimated 50–100 'pairs' in 1999.

Nightingale. The contrast with Limpsfield Common is clear — instead of the decline or perhaps extinction there, the 'usually two pairs' of 1942 had been transformed to eight pairs in 1997 and eleven in 1999 (Prowse pers. comm.).

Blackbird and **thrushes.** The implication is that there were fewer **song thrushes** than blackbirds in 1997, but it is not clear that this was so in 1942. Prowse (pers. comm.) considers numbers of **song thrushes** to be currently similar to those of the 1940s. **Mistle thrushes** are perhaps now more numerous — 'possibly one nest' in 1942 but four pairs in 1997.

Warblers, goldcrest and **spotted flycatcher**. The data for these species are better quantified and those for warblers and goldcrest are summarized in Table 3. It will be seen that the contrast with Limpsfield Common is marked — substantial increases in **whitethroat, garden warbler, blackcap, chiffchaff** and goldcrest and declines in only **lesser whitethroat** and **wood warbler.** The spotted flycatcher has also declined, the one to two pairs in 1942 contrasting with a single bird seen in 1996 and none in 1997.

Tits, nuthatch and **treecreeper.** The data are too general to permit firm conclusions on most of the tits, but it is of interest that there were still seven pairs of **marsh** (but no **willow**) **tits** in 1997 though Prowse (pers. comm.) has noted a subsequent rapid decline with only one record in 1999. Willow tits seem never to have been numerous on Bookham Common, but in 1942 marsh tits were noted simply as 'less common than great or blue tits'. Prowse (pers. comm.) estimated 23–29 pairs of nuthatches and 39 pairs of treecreepers in 1999 compared with 'a few' and 'not common' respectively in 1942, so both species have evidently increased markedly.

TABLE 3. Breeding season populations of selected species on Bookham Common, 1942 (from Carrington et al. 1944) and 1997 (from Prowse 1998).

	1942	1997
Grasshopper warbler	possibly one pair	1 male singing
Lesser whitethroat	7 song posts	2 males temporarily
Whitethroat	7 song posts	31 pairs
Garden warbler	5 song posts	23 pairs
Blackcap	13 song posts	49 pairs
Wood warbler	1–2 males	nil (1 pair in 1996)
Chiffchaff	9 song posts	29 pairs
Willow warbler	abundant	51 pairs
Goldcrest	winter only	6 pairs

Red-backed shrike. Three pairs nested at Bookham Common in both 1942 and 1943, with an additional territory in the latter year.

Crows. There may be fewer **jackdaws** at Bookham Common now than in the past ('several nests' in 1997, but 'fairly common' in 1942). **Rooks** are certainly less numerous ('abundant' in 1942 with a twenty-two-nest rookery just outside the survey boundary, but not commented upon in 1997). In contrast, there are clearly more **magpies** ('common' compared with 'not common') and **carrion crows** (eleven pairs compared with one to two pairs). **Jays** may also be more numerous ('common' compared with 'surprisingly infrequent').

Finches. There is little evidence for major change in most species. Interestingly, **linnets** and **goldfinches** appear to have been equally scarce at Bookham in 1942 as in 1997. Although **hawfinches** were recorded in 1997 and a winter flock is often present, it is not known whether they currently nest on Bookham Common (Prowse pers. comm.). In 1942 they were described as 'fairly frequent — up to eight together'.

Discussion

The comparisons in Table 1 invite the conclusion that many more breeding species have declined or been lost on Limpsfield Common than have been gained over the sixty or so years under review, with the result that the number of breeding species is now only around half what it was. This conclusion might be invalid, or at least less robust, if, as a single observer, I missed more individuals and species than did the groups of observers who carried out the original surveys. While that potential error cannot be completely discounted, the suite of species found in 1999 is generally consistent with that occurring on Limpsfield Chart for which I have extensive information collected over many years. Where it is not, for example in the absence of tree pipit and the scarcity of garden warbler, I made particular effort to locate those species in my follow-up visit in June and still failed to find them. Likewise, the numbers of birds of individual species found in 1999 were unsurprising compared with my experience of Limpsfield Chart. I therefore conclude that my broad assessment of a substantial impoverishment in the avifauna is valid. At the detailed level, however, the scale of change recorded for an individual species as revealed by Table 1 may not be reliable. In assessing apparent changes, comparison has been made with national data available since the mid 1960s. References to this are from Marchant et al. (1990) unless otherwise stated. It should be remembered, however, that a recent national decline might not have resulted in a lower population than when the national data first began to be collected thirty years ago. In the case of willow tit, for example, a decline in the 1980s took it back to its population level in the mid 1960s. There is, of course, for most species, no reliable means of assessing national populations prior to that period.

Ignoring grey partridge (the occurrence of which on the Common at any time in this period is doubtful) and species only seen flying over, the evidence suggests that at least twenty-two species are either extinct or much reduced on the Common as breeders. This figure excludes blackbird and chaffinch, for which the evidence of decline is not clear. This compares with only three or four species (blackcap, magpie, carrion crow and perhaps nuthatch) that have increased. The decreasing species are analysed in Table 4, from which it will be seen that seventeen have been subject to national declines in recent decades. Of these, the immediate cause of the disappearance of skylark, sand martin, linnet and yellowhammer is, nevertheless, likely to have been loss of suitable habitat and this, perhaps combined with increasing public usage, may also have applied to the nightjar. Seven of the remaining declining species are migrants, three that were, or are, at the edge of their range in southern Britain (wryneck, nightingale and red-backed shrike), and four (turtle dove, tree pipit, wood warbler and spotted flycatcher) that have suffered recent declines for which no definitive explanation has been demonstrated. The remaining five species in this category are residents — song thrush, mistle thrush, marsh tit, willow tit and starling. No obvious factors of a wholly local nature have been identified that might explain their decline on the Common and it must be presumed that they and the seven migrant species have been subject to whatever factors have affected these species nationally, at least in the second half of the sixty-year period under review. In the case of turtle dove, however, the national decline to the end of the 1980s was mainly outside south-east England (Gibbons et al. 1993).

TABLE 4. Breeding species thought to have declined on Limpsfield Common between 1937–40 and 1999, indicating factors that could have caused decline.

	National	**Habitat change**	**Unknown**
Turtle dove	×		
Nightjar	×	×?	
Wryneck	×		
Skylark	×	×	
Sand martin	×	×	
Tree pipit	×		
Nightingale	×		
Song thrush	×		
Mistle thrush	×		
Lesser whitethroat			×
Whitethroat		×	
Garden warbler			×
Wood warbler	×		
Willow warbler		×	
Spotted flycatcher	×		
Marsh tit	×		
Willow tit	×?		
Red-backed shrike	×		
Starling	×		
Linnet	×	×	
Hawfinch			×
Yellowhammer	×	×	

Although the whitethroat suffered a massive decline in the late 1960s, it has since made a substantial recovery and is now not uncommon in hedgrows on the agricultural land to the south of the Common. It seems likely that the immediate cause of its disappearance is the loss to woodland of most of the scrub habitat. This may also be the cause of the reduction in willow warblers. There is no obvious explanation for the decline or loss of the remaining three species — lesser whitethroat, garden warbler and hawfinch. Nationally the lesser whitethroat appears to be subject to irregular, but substantial, fluctuations in its population. Likewise the garden warbler suffered a sharp decline in Britain in the 1970s, but has since begun to recover. In the case of the hawfinch Gibbons et al. (1993) suggest that there may have been a reduction in south-east England as a result of the loss of mature trees in the gale of October 1987, but it is doubtful that this applied to Limpsfield Common, where the worst losses of whole stands of trees were limited to Ridlands. In any case, when they did occur in the district in the 1960s and 1970s, hawfinches were most often to be seen in gardens (Osborne pers. comm.).

All four species that have, or may have, increased on Limpsfield Common (nuthatch, blackcap, magpie and carrion crow) have also prospered nationally, the nuthatch and blackcap since the 1950s or earlier and the two crow species for most of the last century. Reasons for the blackcap's success are obscure, but locally the change from heath to woodland must have assisted its increase on the Common. The increase in the nuthatch in Britain has been most evident in its range expansion, but again, locally, the habitat change has presumably been in its favour. The two crow species have exploited new habitats nationally, but the reduction in gamekeeping has often been cited as an important reason for the initial increases after the First World War. In the period under review there has been no keepering on Limpsfield Common, though it still occurs on nearby estates. Persecution by local farmers, now slight if it occurs at all, was perhaps more prevalent at the time of the earlier surveys and may have had the effect of keeping numbers of both species low on the Common. In any case the undoubted increase of three species and the probable increase of the fourth are certainly a reflection of the national picture.

There is an apparent inconsistency between the analysis of possible reasons for declines at Limpsfield, where nationally operating factors appear to be the cause in a number of species, and the more satisfactory state of affairs at Bookham, which seems likely to be attributable to favourable habitat management. The implication is that effective habitat management can stem or reverse declines that are otherwise occurring over wide areas. While that is obviously not true of wryneck and red-backed shrike, it seems possible that it has applied to nightingale, whitethroat and garden warbler, all of which increased at Bookham but suffered decline or possibly local extinction at Limpsfield. In the case of the nightingale it has also declined elsewhere in east Surrey (Osborne pers. comm.); whether that implies further loss through similar degradation of habitat as has occurred at Limpsfield or through some other cause is unclear. The active maintenance of scrub and grassland may have helped these species at Bookham and perhaps also contributed to the maintenance of turtle dove in contrast to its disappearance from Limpsfield. Bookham certainly now has more nuthatches and treecreepers than in the past and until very recently retained its marsh tits. Its damp mature oak woods are inherently more suitable for that species than the dry secondary woodland of Limpsfield, but it is not obvious why the nuthatch and treecreeper should have increased so markedly there but not on Limpsfield Common.

The vegetational changes at Limpsfield Common resulting in an increase in secondary woodland and a loss of open heathland have resulted in a less varied habitat. In contrast the management regime at Bookham has been directed at the maintenance of diverse habitats. Additionally, Limpsfield Common, crossed by many busy roads, is more fragmented than Bookham Common which has only tracks and bridleways. Both lack of habitat diversity and fragmentation tend to reduce the number of species occurring in a given area (Lawton 1985) and on these grounds it might be expected both that the species diversity at Limpsfield Common would have declined since the original surveys and would be poorer than at Bookham Common. On the other hand, the fragmenting and disturbance effect of busy roads may not have affected some of the more numerous species, as all three of the common warbler species occurring on the Common can readily be heard singing (traffic noise permitting) from beside the A25. While increased usage by both humans and dogs and the greater number of potential predators such as magpies, crows and grey squirrels might also have contributed to the declines at Limpsfield, these factors also apply at Bookham (Prowse 1999). There seems no reason to suppose that their effect was any greater at Limpsfield or, therefore, that they can explain the differences in bird populations between the two sites.

The factors affecting the success or failure of a species are, of course, diverse, complex and difficult to establish. The data available for Limpsfield and Bookham are insufficient to confirm the reasons for the observed changes (or the lack of them). So far as Limpsfield is concerned, the comparison with Bookham does, however, suggest that management more focused on actively improving the habitat for wildlife might have enhanced, or could in the future enhance, both the diversity of species and the populations of individual species. Such management might include thinning of trees and creation of rides and glades in areas where currently there is no intervention as well as continuing attempts to restore and maintain areas of heather and gorse. Heathland is fast disappearing in Surrey. In the ten years to 1985 it was estimated that some 940 hectares were lost in the county, leaving only around 5,000 hectares remaining. Of those almost 1,000 hectares were described as overgrown and thus presumably likely to have been lost since (Lindley n.d.). Even a small additional area restored on Limpsfield Common would thus be of importance in the context of the county as a whole.

For the reasons given earlier, not too much should necessarily be made of the differences in the winter surveys reported here. It seems beyond doubt, however, that the woodpigeon is now much more numerous than sixty years ago, perhaps as a result of changing agricultural practices on the adjacent farmland. It also seems likely that the great spotted woodpecker is now more numerous. If this is the case, it is presumably, at least in part, due to the greater area of woodland now present. Nationally it increased sharply between the mid 1970s and the mid 1980s, principally in south-east England, to levels that were maintained at least until the end of the latter decade (Gibbons et al. 1993). The absence of marsh and willow tits in 1999 is consistent with the breeding season survey as is the increase in carrion crow and magpie. The larger number of redwings and jays in 1999 seem likely simply to reflect the availability of variable food supplies. It is not clear that other changes revealed by the winter surveys can be taken as evidence of any real changes in abundance.

Reference should perhaps be made to three species not recorded in any of the surveys — woodcock, collared dove and tawny owl. Both woodcock and tawny owl currently breed in the district (pers. obs.) and have been reported on or near Limpsfield Common (Osborne pers. comm.); it must be a matter of conjecture as to whether they occurred on the Common at the time of the earlier surveys. The collared dove was not of course present in Britain until the 1950s. Although it is now well established in the areas surrounding Limpsfield Common, it was not recorded in any of the 1999 surveys. It can frequently be heard, and sometimes seen, from the Common as it occurs in the adjacent house and garden zone. The habitat on the Common is not, however, suitable for it.

Finally, although the size and nature of the habitat are quite different to that of the Commons that are the subject of this paper, it is perhaps worth drawing attention to the wholly contrasting situation that has occurred in Inner London.

Whereas one might expect the centre of the built-up area to have fared far less successfully than the semi-rural periphery, the opposite has been the case so far as species diversity is concerned. Even excluding species associated primarily with aquatic habitats (much more important in Inner London than on the Commons) a total of forty-two species was recorded breeding in Inner London in the late 1940s and between 1988 and 1994. Of these, thirty had certainly or probably increased or bred for the first time in Inner London in the latter period and only three species were lost. Details are given in Appendix 4. Many of the species occur in small numbers or are irregular in their appearance, but the contrast with the superficially more benign semi-rural habitats gives cause for thought as well as, perhaps, concern at what really has really happened to those habitats.

While the continued existence of semi-rural common land only just over thirty kilometres from St Paul's Cathedral is a matter of some satisfaction in today's environment, it is clear that a largely unmanaged habitat is, by itself, insufficient to retain a diversity of bird (and no doubt other) species. A small area cannot be entirely immune from the wider changes resulting in the loss of species such as red-backed shrike and wryneck, or the increase in widely successful species such as magpie or carrion crow. Yet the comparison with the more actively managed habitat at Bookham Common demonstrates the importance of well-directed intervention if both the diversity and size of animal and plant communities is to be maintained, let alone improved.

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APPENDIX 1

Scientific names of species mentioned in the text

Birds

Sparrowhawk *Accipiter nisus*
Kestrel *Falco tinnunculus*
Woodcock *Scolopax rusticola*
Grey partridge *Perdix perdix*
Pheasant *Phasianus colchicus*
Feral pigeon *Columba livia*
Stock dove *Columba oenas*
Woodpigeon *Columba palumbus*
Collared dove *Streptopelia decaocto*
Turtle dove *Streptopelia turtur*
Cuckoo *Cuculus canorus*
Little owl *Athene noctua*
Tawny owl *Strix aluco*
Nightjar *Caprimulgus europaeus*
Swift *Apus apus*
Wryneck *Jynx torquilla*
Green woodpecker *Picus viridis*
Great spotted woodpecker *Dendrocopus major*
Lesser spotted woodpecker *Dendrocopus minor*
Skylark *Alauda arvensis*
Sand martin *Riparia riparia*
Swallow *Hirundo rustica*
House martin *Delichon urbica*
Tree pipit *Anthus trivialis*
Pied wagtail *Motacilla alba*
Wren *Troglodytes troglodytes*
Dunnock *Prunella modularis*
Robin *Erithacus rubecula*
Nightingale *Luscinia megarhynchos*
Grasshopper warbler *Locustella naevia*
Lesser whitethroat *Sylvia curruca*
Whitethroat *Sylvia communis*
Garden warbler *Sylvia borin*
Blackcap *Sylvia atricapilla*
Wood warbler *Phylloscopus sibilatrix*
Chiffchaff *Phylloscopus collybita*
Willow warbler *Phylloscopus trochilus*
Goldcrest *Regulus regulus*
Spotted flycatcher *Muscicapa striata*
Long-tailed tit *Aegithalos caudatus*
Marsh tit *Parus palustris*
Willow tit *Parus montanus*
Coal tit *Parus ater*
Blue tit *Parus caeruleus*
Great tit *Parus major*
Nuthatch *Sitta europaea*
Treecreeper *Certhia familiaris*
Red-backed shrike *Lanius collurio*
Jay *Garrulus glandarius*
Magpie *Pica pica*
Jackdaw *Corvus monedula*
Rook *Corvus frugilegus*
Carrion crow *Corvus corone*
Starling *Sturnus vulgaris*
House sparrow *Passer domesticus*
Chaffinch *Fringilla coelebs*
Greenfinch *Carduelis chloris*
Goldfinch *Carduelis carduelis*

Black redstart *Phoenicurus ochruros*
Redstart *Phoenicurus phoenicurus*
Blackbird *Turdus merula*
Song thrush *Turdus philomelos*
Redwing *Turdus iliacus*
Mistle thrush *Turdus viscivorus*
Linnet *Carduelis cannabina*
Redpoll *Carduelis flammea*
Bullfinch *Pyrrhula pyrrhula*
Hawfinch *Coccothraustes coccothraustes*
Yellowhammer *Emberiza citrinella*
Reed bunting *Emberiza schoeniclus*

Mammals

Rabbit *Oryctolagus cuniculus*
Grey squirrel *Sciurus carolinensis*

Plants

Pine *Pinus*
Birch *Betula*
Beech *Fagus*
Oak *Quercus*
Hawthorn *Crataegus*
Rowan *Sorbus*
Cherry *Prunus*
Sycamore *Acer*
Bramble *Rubus*
Gorse *Ulex*
Heather *Calluna*
Bluebell *Endymion*
Bracken *Pteridium*

APPENDIX 2

Principal vegetation types on Limpsfield Common, 1938 and 1999

	1938	1999
West Heath	Grass, heather and bracken, with oak and birch in a narrow strip round edges, mixed with pines on southern edge. Central area gorse.	Mainly dense oak and birch. A few small patches of gorse. Western end cleared of birch in 1991 and heather regenerated. Bracken sprayed and regenerating birch cut in 1998, but already in 1999 both again beginning to swamp heather (Figure 2).
Wolfs Hill Wood	Central area heather and bracken, otherwise mainly birch and oak.	Virtually all dense oak and birch with some sycamores. No recent management.
Lovelands Heath	Southern part mostly bracken, heather and gorse. Northern part grass, heather and bracken with an extensive area of gorse and another of birch and oak. The latter with bracken, so evidently not dense.	Dense oak and birch. Partly cleared some years ago in unsuccessful attempt to regenerate heather; now a dense mass of regenerating birch up to 2 m high (Figure 3).
Hookwood and North Wood	Strip of pine and beech on north slope. Most of rest of north side mixed open woodland. East side mainly gorse with mixed areas of bramble, grass and gorse. Some oaks and sycamores. Playing field and part of golf course grass.	North slope, playing field and golf course largely as in 1938. East side now a dense wood of oak, birch and some sycamore, with an impenetrable understory dominated by bramble. No recent management.

	1938	**1999**
Golf Course	Apart from the grass of the course itself, oaks along borders with several areas of heather.	Similar to 1938, but much reduced areas of heather. Trampling by golfers thought to be reducing heather further.
Ridlands	Mainly oak, beech and holly.	Substantial area of mature oak and beech. Bramble-dominated scrub removed 1996 and now largely bare apart from bluebells in the spring. One area lost in storm of 1987 replanted with oak and beech in 1990. Birch and some rowans and cherries naturally regenerated; birch thinned periodically.
Central Heath	Predominantly bracken, gorse and heather. Small and mostly isolated areas of oak and birch.	Mainly oak and birch with some sycamore and in central valley mature beeches and oaks. A few small areas of grass (retained by cutting) with failing heather and occasional gorse (Figure 4).
Links Heath	Predominantly grass, bracken and heather with some oak and hawthorn (but no birch), mainly at borders.	Golf course with mature oak and birch, with dense scrub beneath, around edges and in a strip across centre. Main path across this section surfaced with limestone chippings in 1998.

Information for 1938 from map in Castell (1939) and for 1999 from R. Reed (pers. comm.) and personal observations. For the purposes of this summary, the areas defined by Castell (1939) have been combined under the headings used above as follows:

West Heath:	A Andrews Heath; B Wildshaw Heath; C South Border Wood; D West Heath Sand Pit; E St. Michaels Heath; F Sallow Pool Wood.
Wolfs Hill Wood:	G Triple Wood; H Wolfs Hill Wood.
Lovelands Heath:	L Lovelands Heath; M Pebble Hill.
Hookwood and North Wood:	V Playing Fields; W Hookwood; X North Wood; Y Quarry; Z Quarry Heath.
Golf Course:	S Ballards Shaw Heath; U Golf Course.
Ridlands:	T Ridlands Wood.
Central Heath:	K Happy Valley; N Central Heath; Q Central Copse.
Links Heath:	P Links Pit; R Links Heath.

APPENDIX 3

Species recorded breeding or probably breeding at Bookham Common in 1942 or 1943 and 1997, analysed according to population changes

No evidence of change — 22 species: sparrowhawk, kestrel, stock dove, woodpigeon, turtle dove, cuckoo, little owl, green woodpecker, wren, robin, blackbird, song thrush, grasshopper warbler, marsh tit, coal tit, blue tit, great tit, jackdaw, starling, chaffinch, bullfinch and reed bunting.

Breeding in 1997, but apparently not in 1942 or 1943 — 3 species: tawny owl, pied wagtail and goldcrest.

Confirmed or probable increase since 1942 or 1943 — 15 species: great spotted woodpecker, dunnock, nightingale, mistle thrush, whitethroat, garden warbler, blackcap, chiffchaff, willow warbler, long-tailed tit, nuthatch, treecreeper, jay, magpie and carrion crow.

Lost as breeding species since 1942 or 1943 — 9 species: wryneck, skylark, tree pipit, meadow pipit, lesser whitethroat, wood warbler, spotted flycatcher, red-backed shrike and rook.

APPENDIX 4

Species not primarily associated with aquatic habitats recorded breeding in Inner London in the 1940s or between 1988 and 1994, analysed according to population changes

No evidence of change — 10 species: feral pigeon, stock dove, woodpigeon, tawny owl, great spotted woodpecker, black redstart, blue tit, great tit, starling and chaffinch.

Breeding confirmed in 1988–94, but not breeding in 1940s — 15 species: sparrowhawk collared dove, green woodpecker, skylark, house martin, blackcap, chiffchaff, willow warbler, goldcrest, long-tailed tit, nuthatch, magpie, linnet, redpoll, bullfinch.

Evidence of definite increase between 1940s and 1988–94 — 8 species: kestrel, pied wagtail, wren, coal tit, treecreeper, carrion crow, greenfinch and goldfinch.

Evidence of probable increase between 1940s and 1988–94 — 7 species: swift, dunnock, robin, blackbird, song thrush, mistle thrush and jay.

Lost as breeding species since 1940s — one species: jackdaw.

Decline in breeding population since 1940s — two species: spotted flycatcher and house sparrow.

Based on information in Cramp and Teagle (1952) and Oliver (1997).

Book review

Wimbledon Common & Putney Heath. A natural history. Edited by Tony Drakeford and Una Sutcliffe. Wimbledon and Putney Commons Conservators. 2000. 222 pp., lavishly illustrated with over 200 colour and 20 black-and-white photographs, hardback and with coloured dust jacket. ISBN 0 9501887 5 1. £25 plus £4 p. & p. from Natural History Book Service Ltd, 2–3 Wills Road, Totnes, Devon TQ9 5XN, tel. 01803 865913, e-mail: orders@nhbs.co.uk

This is a superb book and I have no hesitation in recommending it to readers of this page. Just by chance, I was coming out of the General Library in The Natural History Museum on 18 October when I walked into my former colleague Dr Tony Sutcliffe, husband of the book's co-editor. He showed me an advance copy and explained that the shipment had just arrived from Hong Kong and was awaiting collection from the docks. He promised to send me a copy as soon as possible. That few days' warning enabled me, at this late stage, to alert the printer and prepare my thoughts accordingly.

Now that I have the book in front of me and have been able to go through it in reasonable detail, my first impressions are confirmed. Of the editors, Tony Drakeford is an experienced entomologist and since 1994 has been a member of the Board of Conservators of Wimbledon and Putney Commons. It was his inspiration in the mid 1990s that it would be timely to publish a new multi-author book on the natural history of the Commons, the only previous work devoted entirely to the natural history being as long ago as 1912. Una Sutcliffe is also on the Board of Conservators and is Field Secretary of the Ecology & Conservation Studies Society. For her M.Sc. dissertation she produced *A study of the soil hydrology of Farm Bog, Wimbledon Common and its effect on the distribution of plant species.* Both of the editors have contributed to several sections of the text, and the other contributors are either members of the London Natural History Society or are well known to us. The result is a scholarly account of how the present flora and fauna are related to the diversity of habitats, which in turn are influenced by geology and past and present land use.

Following the aptly befitting Foreward by David Bellamy, Tony Drakeford sets the general scene in his Introduction and refers to the patchwork of mature mixed woodland, the prime heathland, the grassland, scrub, ponds, meres and fine bogs and streams, including the Beverley Brook. All of this is governed by two of the most important features of the land, the 'Geology and drainage', described in detail in the next chapter by Antony and Una Sutcliffe. This is followed by Simon Jennings and Christine Smyth describing 'Six thousand years of history preserved in Farm Bog'. Here, examination of fossil pollen demonstrates vividly the nature of past conditions. Peat bogs with long pollen sequences are rare in the London area, and Farm Bog is one of the finest known examples. This is followed by 'A disturbed landscape' in which Una Sutcliffe describes man's activities which have made many changes to the area, from early Bronze Age through 'people pressure', military activities during two world wars, artificial drainage, mineral extraction and the construction of artificial hills, these the result of spoil dumped during modern nearby road widening and underpass schemes. The next chapter is on 'Management', so vitally important in public places such as this where people pressure has to be allowed for but controlled beneficially and sympathetically. This is essential these days with an increasing population with more (or even too much!) leisure time.

Chapter 6 takes us now into the 'Terrestrial habitats of the Commons' in which the more colourful and visible fauna and flora are to be found — the plateau, the made ground and the woodland. Then from chapters 7 to 16 we cover the 'Fungi and lichens', 'Aquatic habitats on the Commons', 'Special studies of selected habitats' in which 7 Post Pond and life in an oak tree are described, 'Butterflies, grasshoppers, bush-crickets and dragonflies', 'Beetles and bumble bees', 'Fish, amphibians and reptiles', 'Birds', which includes a detailed account of their populations by Ron Kettle, 'Mammals on the Commons', 'Extracts from a keeper's diary' and 'Habitat creation and habitat restoration' complete the text. In his Foreward, David Bellamy, as a botanist, refers to the absence of a section specifically on the flora, and asks why. He answers that himself with the observation that 'lists of plants do get boring for the uninitiated, so they are cunningly hidden in the chapters about habitat'. They are included, of course, in the index, but presumably this would not enable a total list of species to be compiled. Perhaps that is something our botanists might be planning: it would complement and could be compared with the list from Barnes Common, just two miles north, published in *The London Naturalist* 78, 1999.

The presentation of the text, the choice of illustrations and the extremely easy style throughout surely make this one of the best local natural histories ever produced. The editors, publishers and contributors are to be congratulated in setting a superb example of what can be the result of good study, good research and good design. It would be rather nice if the LNHS could produce such a treatise on Bookham Common or Hampstead Heath, areas with similar public pressures and with equally valuable biotas — just a thought!

K. H. Hyatt, Editor, *Lond. Nat.*

London butterfly monitoring report for 1999

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Abstract

Collated indices for butterfly species in London for 1999 are presented. During the past year the number of monitored butterfly transects contributing data to the index increased from four to fourteen. Collated indices allow for further sites to join the index in future years. Data from the transects were collated to produce a London index for each species. Whereas the earlier four transects were in north-west London, there is now wider coverage of sites and habitats in London. Each transect is walked weekly between the beginning of April and the end of September, under weather conditions conducive to butterfly flight; and using the same route from week to week and from year to year. Thirty-one butterfly species were recorded on the transects in London during 1999. Relatively low numbers of the large white *Pieris brassicae*, small white *P. rapae* and green-veined white *P. napi* were recorded. Of the longer-term trends, the speckled wood *Pararge aegeria*, gatekeeper *Pyronia tithonus* and purple hairstreak *Quercusia quercus* have increased in London during the past ten to fifteen years. The small heath *Coenonympha pamphilus* appears to have declined and the wall brown *Lasiommata megera* has not been recorded on the transects for five years.

Introduction

Monitoring of wildlife involves repeating a survey at regular intervals, using the same method at the same site. Each individual survey provides information on the species present and their abundance. Monitoring provides data on changes in the abundance of the species.

Pollard and Yates (1993) described several requirements for insect monitoring. The method should be quick, simple to use, and provide good estimates of population size for all of the species present. Whilst they argued that capture-mark-recapture techniques provided information on absolute population size, that method was too demanding in terms of time and labour resources to be considered for monitoring on a large scale. The counts of butterflies on transect walks used for monitoring are a compromise between the ideal and what can be achieved in practice. Rather than information on absolute population size, transect walks provide an index of population size, which can provide an estimate of change in abundance over time (Pollard and Yates 1993).

The transect walk has become a widely adopted method for monitoring butterflies in the United Kingdom (Pollard and Yates 1993). Since the inception of weekly walked transects in the mid 1970s, the number of transects in the United Kingdom has increased to an estimated 600 (Butterfly Conservation pers. comm.). Data from individual transects can be collated to produce indices covering a number of sites (Pollard, Hall and Bibby 1986, Pollard and Yates 1993). The British Butterfly Monitoring Scheme now has 120 transects throughout the country, in which the National Nature Reserves are well represented (Pollard and Yates 1993, Murray and Souter 2000). Other collated indices are based on county areas, for example Hertfordshire and Middlesex, where there were sixty-two transects in 1999 (Murray and Souter 2000), and for particular habitats, e.g. chalk downland. Thus, results from an individual transect may contribute to more than one collated index.

London now has a number of transects, each of which is walked approximately once weekly in the twenty-six weeks between April and September. By collating data from the transects we have the ability to highlight annual changes in the abundance of butterfly species in London and of longer-term trends. The first butterfly transect in London was established at Hampstead Heath in 1978 and walked by Ray Softly, initially as the only 'urban' transect in the national scheme. Two previous papers (Williams, Rix and Greenwood 1998, 1999) have provided collated indices for four open spaces in north-west London. During the past year, ten other transects have joined the index and thus increased the coverage to other areas within London. Data are available from one other transect, at Tower Hamlets Cemetery Park, which will contribute to the index once two consecutive years of data are available. The London index aims to cover the Greater London area. This also corresponds to the area of the London Biodiversity Audit (London Biodiversity Partnership 2000) and to the remit of the Mayor of London in preparing the London Biodiversity Action Plan. As a large conurbation, London has an ecology differing from adjacent shire county areas, though inevitably a high proportion of transects are at nature conservation sites.

Whether the changes in abundance are due to regional trends or to habitat management at individual sites, or to a combination of both, has to be interpreted from the data and from a knowledge of the individual species. Indices can also highlight divergent changes in abundance of species at individual sites in comparison with regional trends.

Note that there is a continuing role for traditional recording and for other surveys of butterflies. It is intended that notable records will be included in future reports.

Methods

To estimate the changes in abundance of butterfly species in London each year, collated indices were employed. The advantage of using collated indices was to enable meaningful comparisons from year to year, in a situation in which transect sites may have joined the index in different years, and as there is a risk that individual transects may leave the index in the future, even if only temporarily. In circumstances such as these, it would be unrealistic to compare the simple totals of the individual site counts from year to year. Collated indices are not absolute counts of the population (nor are the original site counts), but indices of abundance. The indices are relative from year to year, not from species to species.

There are several methods available for calculating indices, and these rely upon the calculation of ratios of change in successive time intervals. A good introduction is provided by Crawford (1991). The method employed previously (Williams, Rix and Greenwood 1999) was based on simple ratio-estimates widely used in earlier national wildlife monitoring programmes, e.g. of birds and butterflies (Ogilvie 1967, Pollard, Hall and Bibby 1986). Indices could be calculated for each species using those transects that had been recorded in two consecutive years. For a given year, the total count of a species would be divided by the total from the same set of transects in the previous year, and the ratio multiplied by the index of the previous year. In describing the calculations, Crawford (1991) pointed out several problems, in particular errors associated with the effects of sites joining or leaving the index. These could continue to affect the index for years after a site had left the index (see also Moss 1985). Other problems involve the calculation of the index where there were missing values (Underhill and Prys-Jones 1994). For example, if data from a site were not available for a particular year, that site could not be used in the calculation of the collated indices and would therefore have to leave the index until it had achieved a further two consecutive years of data.

With the increased number of transects in the London index, the decision was taken to change the mathematical technique used in the calculation of the collated indices. The method adopted for this paper is that described by Underhill and Prys-Jones (1994). Though more elaborate than that described by Ogilvie (1967), it is mathematically easier to programme for large data sets and is more efficient in making use of counts more than one year apart, reducing the problems associated with sites joining and leaving the index. As a check, index numbers were calculated using both methods from a set of data for the meadow brown butterfly and the two methods yielded similar index numbers (Dave Dawson pers. comm.).

The collation involved the entry of the individual site data into a series of spreadsheets, one for each species, which had been programmed to undertake the collation calculations. Within each spreadsheet data were arranged by site (rows) and year (columns). Missing values were estimated as the product of their row and column totals divided by the grand total: this was an iterative process as each estimate updates the totals; a process handled by the spreadsheet software (Microsoft Excel).

Note that the graphs presented in this year's paper have a logarithmic scale. This is common practice when plotting index numbers: for example see the butterfly indices plotted in Pollard and Yates (1993). Crawford (1991) has provided a summary of the justification for using logarithmic scales when plotting index numbers. Where a logarithmic scale is used the shape of the series remains independent of whatever reference year is adopted for the index.

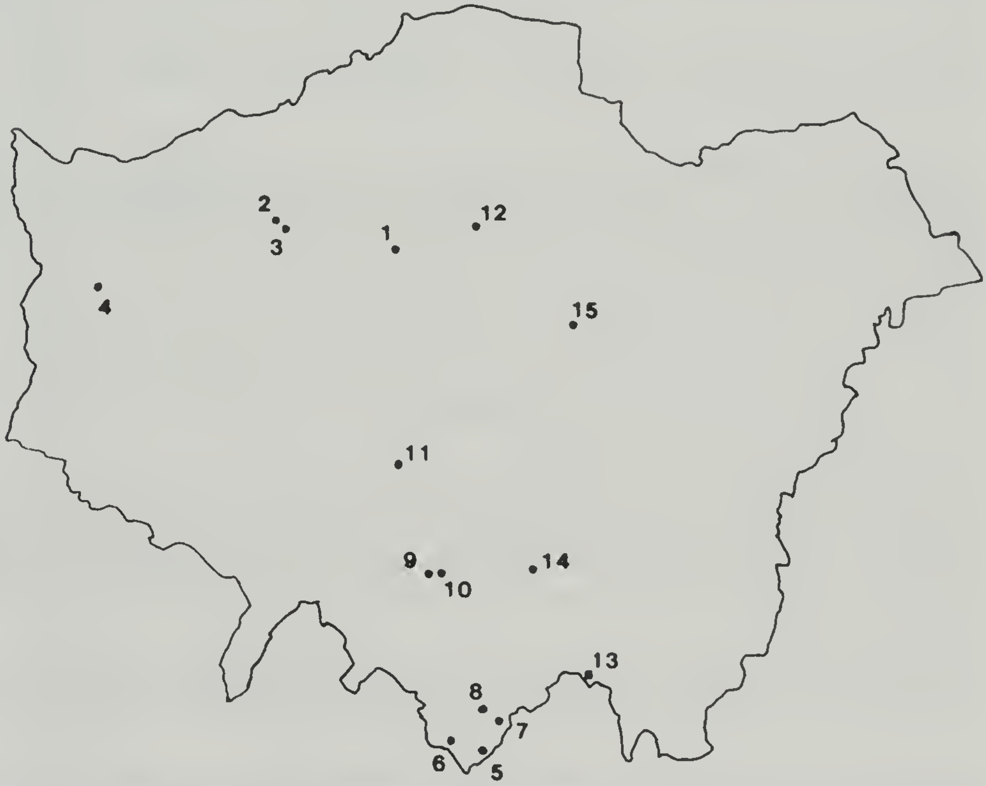

FIGURE 1. Location of butterfly transects in London. 1 Hampstead Heath, 2 Fryent Country Park, 3 Beane Hill, 4 Gutteridge Wood, 5 Coulsdon Common, 6 Farthing Downs, 7 Kenley Common, 8 Riddlesdown, 9 Mitcham Common route A, 10 Mitcham Common route B, 11 Wandsworth Common Woodland, 12 Railway Fields, 13 Hutchinson's Bank Nature Reserve, 14 South Norwood Country Park, 15 Tower Hamlets Cemetery Park.

Should the reference year be changed, the series is shifted vertically upwards or downwards, but not distorted. The disadvantage of logarithmic graphs is that most people find it more difficult to visualize the meaning of a graph from a logarithmic scale (Crothers 1981).

The recording method employed, the transect walk, has been described elsewhere, as are its limitations (Hall 1981, Pollard, Hall and Bibby 1986, Pollard 1991, Pollard and Yates 1993). There is a summary in Williams, Rix and Greenwood (1998). Basically, at each site a walk is undertaken along the same route, each week, between April and September inclusive, within a standard range of weather conditions conducive to butterfly flight. Counts were made of the number of adult butterflies observed to provide a total for each species for the year at each transect. Totals used for this paper include estimates for weeks missed due to poor weather or the unavailability of the recorder(s), calculated from the averages of the two weeks on either side.

For the index, butterflies were surveyed at fourteen sites using the transect walk method. Data for 1999 were also available from the transect at Tower Hamlets Cemetery Park, but have not been included in the index as the data for a single year would have had a neutral effect on the collated index. The transects are briefly described below and their locations within London are shown in Figure 1. The recorders are listed in the Acknowledgements.

Hampstead Heath. Transect established in 1978. Located in the London Borough of Camden, the site is managed by the Corporation of London. For a map of the transect route and for species data for the years 1978–1985 see Pollard, Hall and Bibby (1986). Though the data for 1978–1985 extend the Hampstead Heath series to twenty-two years, it would be inappropriate to estimate the collated indices from one transect alone. The transect is largely through scrub with rough grassland.

Fryent Country Park. Transect established in 1986. The site is in the London Borough of Brent, and managed by Brent Council with assistance from the volunteer Barn Hill Conservation Group. For a map of the route see Williams, Kwissa, Brown and Brown (1991). Habitats include hay meadows, hedgerows, woodland and scrub.

Beane Hill. Transect established in 1988. The transect is in the south-east of Fryent Country Park, in the London Borough of Brent and managed by Brent Council with assistance from Barn Hill Conservation Group. For a map of the route see Williams (1994). The transect is largely through young woodland that was planted in the mid to late 1980s.

Gutteridge Wood. Transect established in 1990. The site is in the London Borough of Hillingdon and managed by the London Wildlife Trust in association with the Borough Council. The mature oak woodland has a hazel understorey. Other habitats include grassland with scrub, boundary ditches and the Yeading Brook.

Coulsdon Common. Transect walked since 1990. Managed and owned by the Corporation of London and situated in the London Borough of Croydon. The site includes grassland and woodland with mown rides.

Farthing Downs. Transect walked since 1990. Managed and owned by the Corporation of London and situated in the London Borough of Croydon. Chalk grassland with woodland.

Kenley Common. Transect walked since 1990. Managed and owned by the Corporation of London and situated in the London Borough of Croydon. Habitats include grassland with some oak woodland.

Riddlesdown. Transect walked since 1990. Managed and owned by the Corporation of London and situated in the London Borough of Croydon. Habitats include chalk grassland, scrub and woodland.

Mitcham 'route A'. Transect walked since 1995, but a year was missed in 1997. Situated in the London Borough of Merton and managed by the Mitcham Common Conservators. The transect includes ruderal vegetation, acidic grassland, scrub and secondary woodland. Transect length: 3.35 km.

Mitcham 'route B'. Transect walked since 1995. Situated in the London Borough of Merton and managed by the Mitcham Common Conservators. The main habitat is neutral grassland with some secondary woodland and acidic grassland. Transect length: 4.03 km.

Wandsworth Common Woodland. Transect walked since 1997. Wandsworth Common is owned and managed by the London Borough of Wandsworth. Habitats include oak scrub that has grown during recent decades, grass clearings and one area of meadow with scrub. The transect is approximately 3 km in length.

Railway Fields. Transect walked since 1997. The site is located in and managed by the London Borough of Haringey. The main habitats are grassland, scrub and woodland.

Hutchinson's Bank Nature Reserve. Transect walked since 1998. Located in the London Borough of Croydon and managed by London Wildlife Trust. Chalk grassland with woodland.

South Norwood Country Park. Transect walked since 1998. Located on the boundaries of the London Boroughs of Croydon and Bromley, but owned and managed by the London Borough of Croydon. Former sewage works converted into a Country Park.

Tower Hamlets Cemetery Park. The transect commenced in 1999 and as there is only one year of data the transect has not contributed to the calculation of the indices. However, comment is provided in the text. The cemetery is in the London Borough of Tower Hamlets who own, and manage the site with the Friends of Tower Hamlets Cemetery Park. Habitats include grassland, woodland and woodland rides (Murdoch and Lyle 1993). The transect is approximately 1.8 km in length.

Results

Collated indices for each species for the years 1986 to 1999 were calculated and are presented in Table 1. An estimate of the relative changes in abundance for each species from year to year is given by the difference in the numerical figures. For example, a butterfly with an index of 50 in one year and 25 in the following year would have been approximately half as abundant in the second year as compared with the first year. Indices have been rounded to the nearest whole number and have usually been set at 100 in 1990 or the first year of record: for a technical discussion see Crawford (1991). A zero in Table 1 implies that a species was not observed on the transects in that year, whereas a blank entry indicates that no transects were walked within the expected London range of that species.

For species with sporadic distributions or which were absent in some years, the programmed spreadsheets were unable to calculate indices for every year and indices have been estimated using ratios with the most recent year for which data were available. This problem arose for the dingy skipper, clouded yellow, painted lady and the wall brown. Similarly, a question mark in Table 1 indicates that a species was present in that year, but that data for subsequent years and/or for more transect sites are required before the calculations can be completed. In

TABLE 1. Collated indices for butterfly species in London, 1986–1999. Indices have been rounded to the nearest whole number and have usually been set at 100 in 1990 or the first year of record. A blank indicates no transect records for that species in that year. A zero implies that a species was not observed on transects in that year. A question mark indicates that a species was present in that year, but that data for subsequent years and/or for more transect sites are required before the calculations can be completed. See the text for further information.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Small and Essex skippers	137	215	243	224	100	254	282	78	251	116	172	194	85	98
Large skipper	88	203	74	239	100	62	235	217	225	131	66	84	48	52
Dingy skipper					100	300	125	300	0	0	0	25	150	130
Grizzled skipper					0	0	0	100	100	0	0	50	?	?
Clouded yellow	0	0	0	0	0	0	0	0	0	0	100	0	33	0
Brimstone	0	0	0	0	100	129	169	119	68	129	117	82	82	80
Large white	71	19	60	136	100	89	567	82	97	129	32	146	261	92
Small white	345	74	127	185	100	165	267	72	134	241	104	230	164	88
Green-veined white	82	43	161	186	100	52	242	88	72	154	73	204	197	102
Orange-tip	4	39	12	42	100	155	118	88	35	72	42	71	69	57
Green hairstreak					0	0	100	250	0	150	50	150	?	?
Purple hairstreak	0	0	0	0	0	0	100	200	200	156	156	435	623	779
White-letter hairstreak							100	50	0	40	120	40	0	?
Small copper	5	30	15	88	100	38	19	13	33	60	58	65	50	16
Small blue					0	0	0	0	100	0	0	100	?	?
Brown argus					100	132	74	21	53	95	83	100	11	14
Common blue	11	11	0	66	100	98	46	24	90	137	67	83	36	48
Chalkhill blue					100	117	54	13	93	109	109	304	75	180
Holly blue	0	0	0	361	300	30	7	4	1	86	148	19	67	55
White admiral													100	0
Red admiral	0	0	62	16	100	57	279	100	121	303	265	94	200	105
Painted lady	0	0	100	0	100	15	69	0	15	23	1,715	23	?	?
Small tortoiseshell	206	298	425	237	100	145	1,023	447	187	284	117	246	180	139
Peacock	238	350	198	149	100	250	963	1,113	439	578	743	757	1,121	1,327
Comma	63	108	90	119	100	82	367	109	100	158	122	150	145	139
Dark green fritillary												100	?	?
Silver-washed fritillary														100
Speckled wood	0	14	42	98	100	101	157	169	213	152	72	129	149	167
Wall brown	29	22	11	94	100	13	3	3	3	0	0	0	0	0
Marbled white											100	?	?	?
Gatekeeper	0	0	0	0	100	97	133	80	97	123	166	169	149	187
Meadow brown	41	138	189	194	100	197	126	54	81	108	141	128	173	150
Small heath	101	137	26	87	100	94	42	11	4	6	22	40	14	8
Ringlet	21	21	6	6	100	224	299	181	311	194	65	143	239	301

the text the 'total count' for each species gives an indication of the size of the count, including estimated counts, from which the indices were calculated. The reliability of the index may be lower for species with low counts. The reliability of the indices may also increase with the number of sites in the index; there were two transects in 1986, three in 1988, eight in 1990, ten in 1995, twelve in 1997 and fourteen from 1998.

SMALL SKIPPER *Thymelicus sylvestris* and ESSEX SKIPPER *Thymelicus lineola*

The small and the Essex skippers are generally counted together by the transect walkers, due to the difficulty of separating these species in flight. At four transects (Gutteridge Wood, Wandsworth Common Woodland, Railway Fields and Tower Hamlets Cemetery Park) attempts were made to identify at least a sample of the species separately. Of a combined sample of 53 identified individuals, 68 per cent were small skippers and 32 per cent were Essex skippers. Small or Essex skippers were recorded on all the transects in 1999. There was a slight increase in the index as compared with 1998. Total count: 1,616.

LARGE SKIPPER *Ochlodes venata*

Despite a slight increase as compared with 1998, the index remained relatively low. A species of rough grassland, the large skipper was recorded on all transects in 1999. Total count: 232.

DINGY SKIPPER *Erynnis tages*

The dingy skipper has a restricted distribution in London. It was confined to one transect in 1999, and the index was slightly lower than in 1998. In the past, it has been recorded on some of the other transects on the southern edge of London. Total count: 40.

GRIZZLED SKIPPER *Pyrgus malvae*

Within the index, the grizzled skipper was confined to one transect site in 1999 where the count was higher than in 1998. In the past, the grizzled skipper has been recorded on some of the other transects on the southern edge of London. Total count: 13.

BRIMSTONE *Gonepteryx rhamni*

The collated index was slightly lower than in 1998. With one exception, there were records from all transects in 1999. A high proportion of counts were from Hutchinson's Bank Nature Reserve and at Kenley Common. There is evidence that the brimstone has become established at Hampstead Heath where it was first recorded on the transect in 1993 and at Tower Hamlets Cemetery Park (Murdoch and Lyle 1993). Total count: 310.

LARGE WHITE *Pieris brassicae*

The large white was recorded at each transect site in 1999, though the index was approximately only a third that of 1998 (Figure 2). Total count: 212.

SMALL WHITE *Pieris rapae*

The collated index was approximately half that of 1998 (Figure 3). Small whites were recorded on each transect in 1999. Total count: 480.

GREEN-VEINED WHITE *Pieris napi*

The index was down by almost a half as compared with 1998. Green-veined whites were, with one exception, recorded on each transect in 1999. Total count: 563.

ORANGE-TIP *Anthocharis cardamines*

The orange-tip was observed on each transect in 1999. The index was slightly lower than in 1998. Total count: 118.

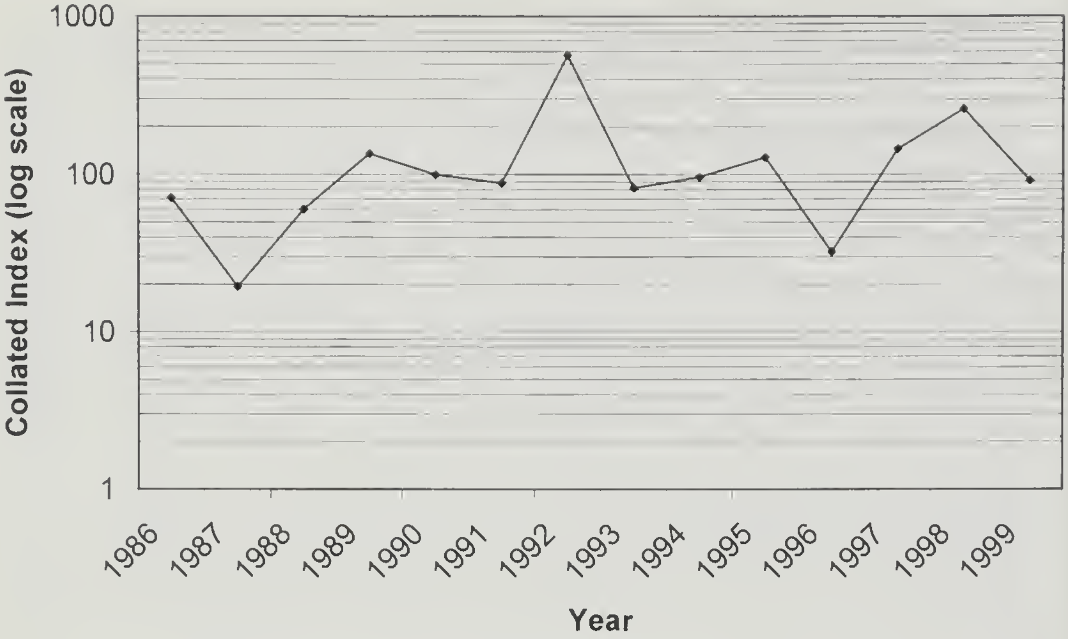

FIGURE 2. **Large white**: collated indices at fourteen transect sites in London for the years 1986–1999.

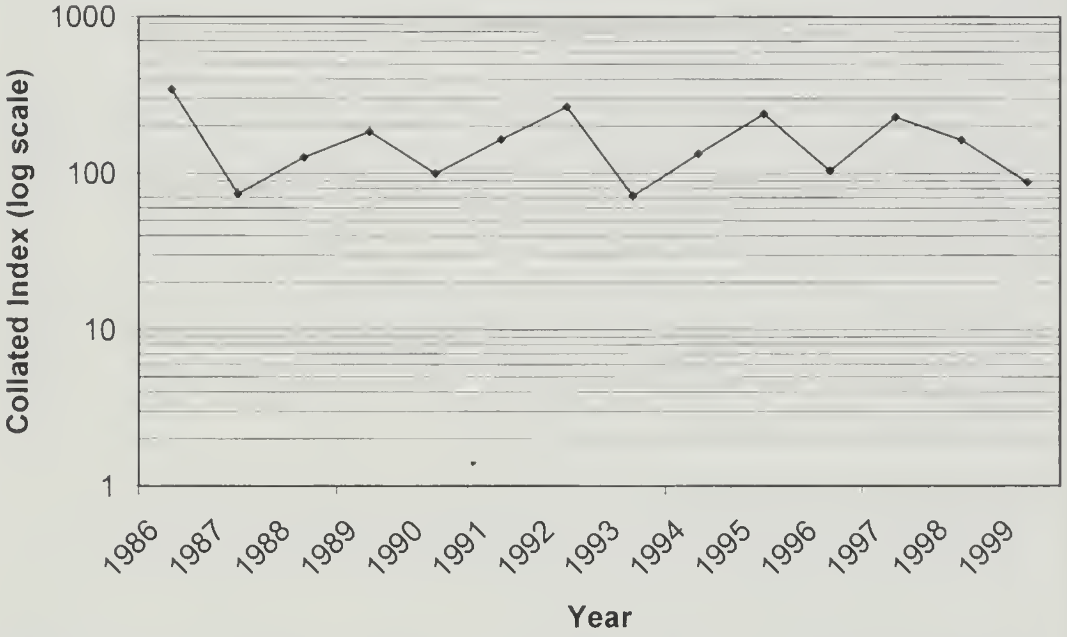

FIGURE 3. **Small white**: collated indices at fourteen transect sites in London for the years 1986–1999.

GREEN HAIRSTREAK *Callophrys rubi*

As in Britain as a whole, the green hairstreak has a restricted distribution in London. In 1999 it was recorded on one transect, though it has been recorded on one other transect. Fewer individuals were recorded than in 1998. A reliable index is difficult to calculate due to the limited data available. Total count: 3.

PURPLE HAIRSTREAK *Quercusia quercus*

The purple hairstreak is generally on the wing in the evening and early daylight hours only and therefore it is one of the few butterfly species for which transect recording is inappropriate. Though small numbers are recorded on transects, the lack of data causes difficulties when calculating the index. In 1999, the purple hairstreak was recorded on five transects. Wandsworth Common Woodland appears to have a relatively high population of this species. There is some evidence, particularly from the eight transects that have been walked since 1990, that the species has increased in London. Total count: 23.

WHITE-LETTER HAIRSTREAK *Strymonidia w-album*

One individual was recorded in 1999 at South Norwood Country Park. Since the inception of the transects, nine white-letter hairstreaks have been counted with six of those at Gutteridge Wood. For technical reasons it has not yet been possible to calculate the index for the two most recent years. Total count: 1.

SMALL COPPER *Lycaena phlaeas*

The small copper is a species of rough grassland. In 1999 it was recorded on eight transects. The species appears to do well at Mitcham Common. The index was approximately only a third of that of 1998. Total count: 42.

SMALL BLUE *Cupido minimus*

As expected, the distribution of this downland species in London is restricted. There have been records from two transects, including Hutchinson's Bank Nature Reserve from which it was recorded in 1999, though with a count of approximately half that of 1998. Total count: 14.

BROWN ARGUS *Aricia agestis*

A species of calcareous grassland particularly where the vegetation is short. Within London it is usually confined to sites with suitable habitat. Records have been made on seven transects and it was recorded from four transects in 1999. The index was slightly higher than that in 1998, but for these two years the indices were lower than for any year since comparable transects were walked in 1990. Total count: 10.

COMMON BLUE *Polyommatus icarus*

The index was higher than in 1998 and the common blue was recorded on all transects in 1999. The best transect sites for this species were chalk grassland sites in south London. However, the common blue and the holly blue are the two 'blue' butterflies that may be observed throughout London. Total count: 375.

CHALKHILL BLUE *Lysandra coridon*

The index was higher than in 1998. Confined to calcareous grassland, the chalkhill blue has a restricted distribution in London, and of the transect sites is confined to chalk grassland in the south of London. Total count: 124.

HOLLY BLUE *Celastrina argiolus*

The index was slightly lower than in 1998. With one exception, the holly blue was recorded on all transects in 1999, though it has a preference for woodland, e.g. at Tower Hamlets Cemetery Park and Wandsworth Common Woodland. Of the blue butterflies it is probably the species most associated with urban areas and gardens. Note that for technical reasons the index has been set at 300 in 1990, to accommodate the low count in 1994 that was less than 1 per cent of the 1990 count (Table 1). Total count: 117.

RED ADMIRAL *Vanessa atalanta*

The red admiral was recorded on eleven transects in 1999, though the index was about half that of 1998. A migratory species, the red admiral can be expected to be observed throughout London. Total count: 38.

SMALL TORTOISESHELL *Aglais urticae*

The index was lower than in 1998 (Figure 4). In 1999, the small tortoiseshell was recorded on all but one transect. It appeared to do well at South Norwood Country Park. Total count: 321.

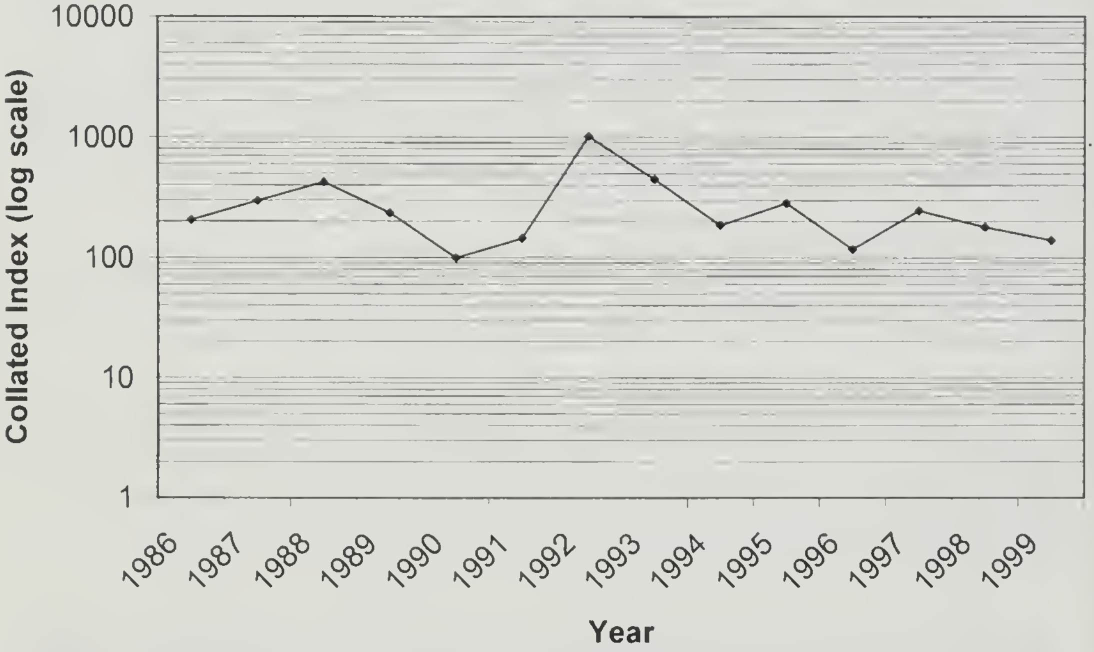

FIGURE 4. **Small tortoiseshell**: collated indices at fourteen transect sites in London for the years 1986–1999.

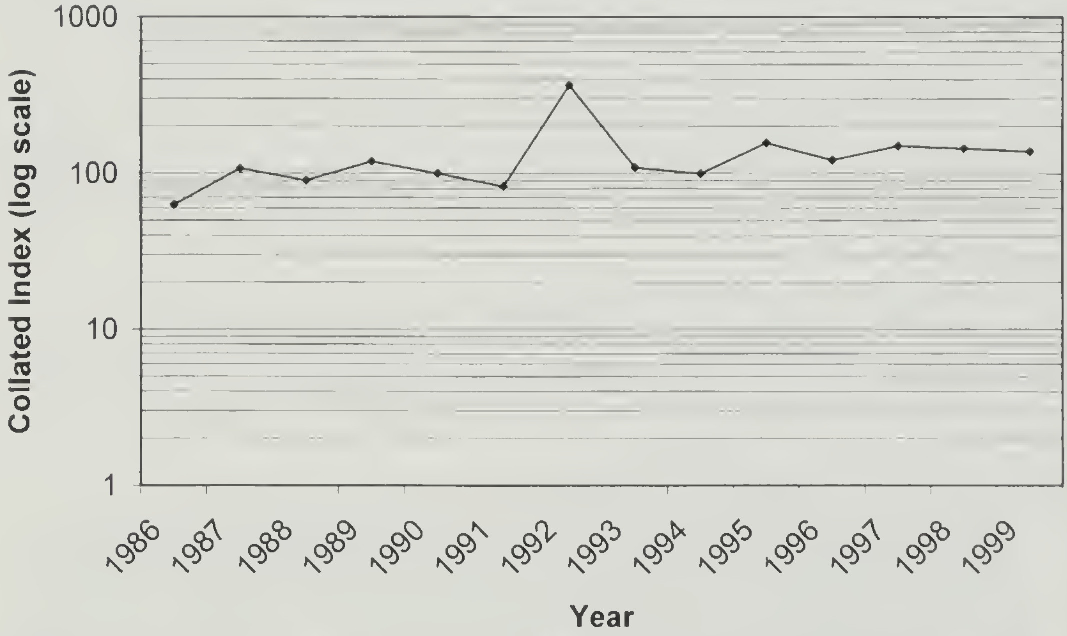

FIGURE 5. **Comma**: collated indices at fourteen transect sites in London for the years 1986–1999.

PEACOCK *Inachis io*

Peacock butterflies were recorded on all transects in 1999 and the index was higher than in 1998. The species appears to have increased in abundance in London during recent years. Peacock butterflies can be expected to occur throughout London. Total count: 905.

COMMA *Polygonia c-album*

The index declined slightly as compared with 1998 (Figure 5). It was recorded on all transects in 1999. Total count: 171.

DARK GREEN FRITILLARY *Argynnis aglaja*

The dark green fritillary has a restricted distribution in London. In 1999 it was recorded from one transect, Hutchinson's Bank Nature Reserve. The count there was higher than in 1998. Total count: 49.

SILVER-WASHED FRITILLARY *Argynnis paphia*

The first record of an individual on a London transect was made in 1999. Total count: 1.

SPECKLED WOOD *Pararge aegeria*

The second most common butterfly on the transects, the speckled wood was recorded at all transects and the index was higher than in 1998. In London it has increased during the last few decades. Plant (1987) considered that the speckled wood was recolonizing London, a process that has continued, and the distribution of the species in London is now more extensive than shown on the map in that publication. At Hampstead Heath, Fryent Country Park and Beane Hill transect records have witnessed the establishment of new colonies. In 1999 the highest count was at Wandsworth Common Woodland. The speckled wood prefers woodland and woodland edge habitats, but can also be seen throughout London. It is also one of the few butterflies that can be seen almost continuously from April to September, due to multiple generations. Total count: 2,016.

MARBLED WHITE *Melanargia galathea*

The marbled white is localized to tall unimproved grassland, particularly but not only on downland. Of the London transect sites, there is a colony at one transect where counts were slightly lower as compared with 1998. Occasionally stray individuals are recorded on other transects in London. Total count: 347.

GATEKEEPER *Pyronia tithonus*

The index for the gatekeeper or hedge brown was the highest since the index commenced. Gatekeepers were recorded on all transects in 1999. The index includes two contrasting patterns. Recolonization in London is evident at Hampstead Heath, Fryent Country Park and Beane Hill where colonies have become established during the years in which the transects have been walked. The gatekeeper has increased at Wandsworth Common Woodland. At Tower Hamlets Cemetery Park the gatekeeper was observed in small numbers in the early 1990s (Murdoch and Lyle 1993), by 1994 it was assumed to be breeding (Game, Whitefield, Yarham and Brownbridge 1996), and a count of 66 was made during the first year of the transect in 1999. Suburban gardens, at least in north-west London, have been host to occasional records since the mid 1990s. Considerable increases in numbers were recorded at the four south London transects walked since 1990. Compare these observations with the map in Plant (1987) in which the gatekeeper had a largely circum-London distribution. However, on the two transects that had the highest counts in 1998, Hutchinson's Bank Nature Reserve and Gutteridge Wood, gatekeeper numbers were lower in 1999 than in 1998. In the case of Gutteridge Wood there appears to be a long-term decline. To put this in perspective, consider the eight transects that have been walked since 1990. In 1990 the gatekeeper count at Gutteridge Wood was 446 and 17 on the other seven transects, whereas in 1999 the count at Gutteridge Wood was 136 while the count on the other seven transects was 712. The patterns suggest colonization or recolonization of suitable green spaces throughout London, while the mature colonies appear to fluctuate in line with wider environmental factors. Total count: 1,160.

MEADOW BROWN *Maniola jurtina*
The slight reduction in the index was due to large reductions in the meadow brown count at the two transect sites that had the highest counts in 1998. Excluding these two sites, the index would have been higher than in 1998 and counts increased at eleven of the transects. Of the sites where numbers declined, Fryent Country Park had the highest count of meadow browns in 1998, but numbers fell by about two-thirds in 1999. This suggested that local management factors were involved. Fryent Country Park has a high proportion of annually cut hay meadows, an ideal habitat for the meadow brown, but in 1999 the hay was cut at an earlier date than in any year since the butterfly transects commenced. A comparison of the date on which hay cutting commenced in each year with the annual count of meadow browns found that there was a statistically significant correlation between the two (Williams 1999). Early cuts in mid June resulted in a lower count of meadow browns than cutting in July or early August. Later cutting may provide more time for the adults to emerge from the chrysalis. It was noted too that in 1999 most of the meadows were cut within a few days, and in the days immediately afterwards meadow browns were observed in high numbers in the woodland of the adjacent Beane Hill transect. This suggested a local migration, though by the end of the season the total meadow brown count was also down on the Beane Hill transect as compared with 1998. Meadow brown numbers declined too at Farthing Downs, the transect with the second highest count in 1998 and a predominately grassland site. The meadow brown has been recorded on each transect in each year that they have been walked, and overall is the most common species on transects. This is probably a reflection of the grassland habitats at nature conservation sites in London, for the meadow brown is less frequently seen in the built-up areas. Total count: 8,323.

SMALL HEATH *Coenonympha pamphilus*
The small heath has declined in London, with the 1999 index about half that of 1998 and less than a tenth that of 1990 (Figure 6). In addition to fluctuations in numbers from year to year, there is a pattern of decline and local extinction at individual transect sites. Of the eight transects walked from 1990 to 1999, seven supported small heath populations in 1990, but only four by the late 1990s. It has also apparently been lost from Wandsworth Common Woodland, where small heaths were noted in the early 1990s. The species was recorded on six transects in 1999. Only on one transect, Mitcham 'A', is there evidence of increased numbers in recent years. The small heath is a species of unimproved grassland. Total count: 107.

RINGLET *Aphantopus hyperantus*
The ringlet is virtually confined to five transects on the outer edge of south London. In 1999 the index for the ringlet was higher than in 1998. Total count: 1,054.

Species that have previously been recorded on at least one of the transects but were not recorded in 1999 were:

CLOUDED YELLOW *Colias croceus*
Since transect recording commenced, there have been only four records of this migratory species: three in 1996 and one in 1998.

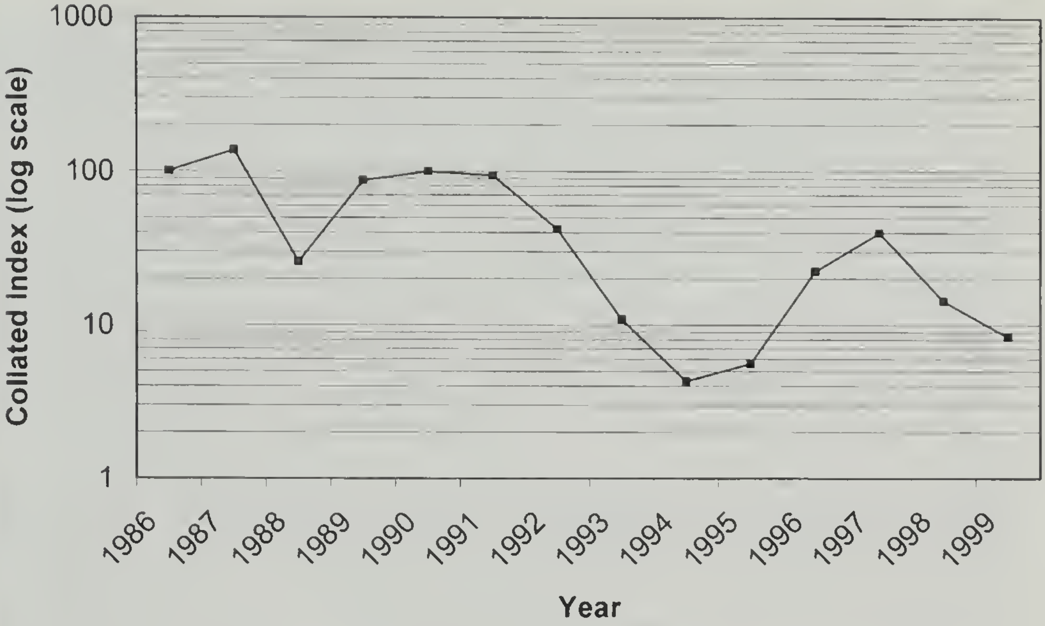

FIGURE 6. **Small heath**: collated indices at fourteen transect sites in London for the years 1986–1999.

WHITE ADMIRAL *Ladoga camilla*

This woodland butterfly was recorded on one transect in 1998.

PAINTED LADY *Cynthia cardui*

A migratory species, the painted lady can be expected to be seen throughout London, though only in years with large migrations, for example in 1996 (Table 1). In 1999 the painted lady was not observed on the transects in the index, but a single painted lady was observed on the transect at Tower Hamlets Cemetery Park.

WALL BROWN *Lasiommata megera*

The wall brown has not been recorded on a transect in London for five years. No wall browns have been recorded on transects at Coulsdon, Farthing Downs, Kenley and Riddlesdown since the transects commenced in 1990. However, in north London the last transect records of wall browns were at Hampstead Heath in 1990, at Beane Hill in 1991, Fryent Country Park in 1993 and at Gutteridge Wood in 1994. The map of the distribution of the wall brown in Plant (1987) showed a relative scarcity in south London, but there was little hint of the forthcoming decline. Outside of London the wall brown has declined in Surrey (Collins 1995), and in Hertfordshire as shown by a comparison of the maps in Sawford (1987) and in Murray and Souter (1999).

Discussion

Collated indices provide estimates of changes in the abundance of butterflies on transects. For some species the indices will be a reasonable reflection of the changes in abundance for London as a whole. Sample sizes for some of the less-common species tend to be low, increasing the effect of chance records or the absence of records. Where a species has been recorded on only a small number of transects, the effect of management factors at those sites on the index figures is increased. Difficulties in calculating an index value also arise when uncommon species are recorded only on different transects in consecutive years, though this may be overcome when data become available in a future year: thus this problem affects the most recent years more than earlier years (Table 1). However, the index should be seen as a contribution to our knowledge of changes in the abundance of butterflies in London. With fourteen transects the coverage of London and the reliability of the indices has improved as compared with the earlier index covering sites in north-west London only.

Thirty-one species were recorded on the transects in the index in 1999 (thirty-two species if the painted lady recorded at Tower Hamlets Cemetery Park transect is included), and in total thirty-five species have been recorded on the transects. Plant (1987) listed thirty-seven resident and common migrant species in London for the years 1980–1986, though the total is thirty-eight if the clouded yellow is included. The additional species noted by Plant (1987) were the brown hairstreak *Thecla betulae*, adonis blue *Lysandra bellargus* and the purple emperor *Apatura iris*. Of the species recorded on the transects, an indication of their distribution in London could suggest the following:

Species expected to be observed throughout much of London: small skipper, Essex skipper, large skipper, brimstone, large white, small white, green-veined white, orange-tip, small copper, common blue, holly blue, small tortoiseshell, peacock, comma, speckled wood, gatekeeper and meadow brown. Gardens and green spaces can potentially attract most of these species, albeit to varying degrees, together with two migrant species (red admiral and painted lady). The painted lady and the holly blue may be practically absent in some years.

Migrants: clouded yellow, red admiral and painted lady.

Species with a restricted or localized distribution in London, often confined to a particular habitat: dingy skipper, grizzled skipper, green hairstreak, purple hairstreak, white-letter hairstreak, small blue, brown argus, chalkhill blue, white admiral, dark green fritillary, silver-washed fritillary, marbled white, small heath and ringlet. Within this list, some species are confined to one habitat, e.g. the chalkhill blue to calcareous grassland, purple hairstreak to oak trees, while other species may occasionally wander and appear elsewhere, e.g. marbled white. The downland species are well represented at Riddlesdown and Hutchinson's Bank Nature Reserve. The effects of geology on the broad distribution of each butterfly species in Surrey including parts of London can be judged from the maps in Collins (1995). For a map of the surface geology of London see Plant (1994).

Species for which there is evidence of an increase in abundance since the mid 1980s are the speckled wood and more recently, the gatekeeper. The purple hairstreak appears to be increasing too. For the brimstone there is no obvious trend from the index, but this species appears to have colonized sites within urban London.

In contrast to the increase in the above species which are generally woodland or woodland edge species, declines are more evident amongst species associated with grasslands. Since the mid 1990s the wall brown has not been recorded on any of the transects in London, though the decline is part of a regional phenomenon and is not confined to London. The small heath has declined in both abundance and in the number of transect sites at which it formerly occurred. During the last two years, there were also reductions in the counts of the small skipper, Essex skipper and large skipper at some transect sites. The most abundant species recorded on the transects, the meadow brown, appears susceptible to changes in management at individual grassland sites from year to year.

With respect to year-to-year changes in populations, the large white, small white and green-veined white were observed in relatively low numbers in 1999.

Monitoring, as explained earlier, is designed to show change rather than produce a league table of records. However, the 'total count' provided for each species listed in the results gave an indication of the counts of each species on the transects. The figures show that the meadow brown was by far the most frequently recorded butterfly on the transects. The ringlet, which is absent from much of London (Plant 1987), had the fifth highest count, and another anomaly is of the chalkhill blue, recorded from only two of the transects, yet with more records than for the orange-tip. There were more records of the marbled white, recorded from one transect only, than of the small tortoiseshell. These figures highlight the extent by which this index of London transects is skewed towards nature conservation sites within the conurbation. The transects are largely confined to the one sixth of London's area that is classified as wildlife habitat (London Ecology Committee 2000, Dawson and Worrell 1992, London Biodiversity Partnership 2000). There is little coverage of recreational green space (e.g. parks) which covers approximately 13 per cent of London, nor of the gardens of private dwellings which cover about 19 per cent of London. None of the transects covers the built environment (e.g. buildings and roads) that occupy approximately 37 per cent of the land area. If an aim of the index was to be representative of the land use types in London, transect walks should be encouraged in suburbia, parks, urban residential, commercial and industrial areas.

Acknowledgements

The London Butterfly Index is a team effort involving transect walkers, local and county co-ordinators, landowners and land managers, and those who have assisted with the statistics and programming. In 1999 the transect walkers included Ian Greenwood with assistance from Aaron Beat and Bob Gillam of the Corporation of London at Hampstead Heath, Ann Rix at Gutteridge Wood, Mike Enfield who co-ordinates the Corporation of London transects at sites in Croydon, Martin Boyle at Mitcham Common, Ian Cunningham at Wandsworth Common Woodland, David Bevan at Railway Fields, Martin Wills at Hutchinson's Bank Nature Reserve, Malcolm Bridge at South Norwood Country Park, and Terry Lyle and Andy McGuire at Tower Hamlets Cemetery Park. Continuity of recording is important and much of our knowledge is dependent upon data collected by earlier recorders. Landowners, local authorities and land managers involved are the Corporation of London, and the London Borough Councils of Brent, Camden, Croydon, Haringey, Hillingdon, Merton, Wandsworth, and Tower Hamlets; the Mitcham Common Conservators, the Friends of Tower Hamlets Cemetery Park, London Wildlife Trust, the Brent Group of London Wildlife Trust, and Barn Hill Conservation Group. Dr Dave Dawson advised on the statistical method for the collations and the programming of the spreadsheets. Simon Mercer helped develop a series of linked spreadsheets. Mike Enfield, John Murray and Gail Jeffcoate of the Butterfly Conservation team in and around London, Colin Plant of the London Natural History Society, and the London Ecology Unit (now part of the Greater London Authority) assisted with establishing the network. Training and financial assistance were provided by a Millennium Awards grant from the Millennium Commission administered by the British Trust for Conservation Volunteers. The preparation of the paper has also been assisted by Rose Bennett of Barn Hill Conservation Group, Paul Hutchinson of Brent Council Parks Service, Ian Yarham of the London Ecology Unit (Greater London Authority), by three referees and by Caroline Williams.

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Plant gall records for 1998 and 1999

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Introduction

This is my second biennial report to the Society, and it is pleasing to note that a few more people are assisting in the gathering of material than in my earlier submission (Hill 1998). This can only lead to a welcome expansion of our knowledge of the biomass of the LNHS area. Records have again come from a wide diversity of localities, and have shown an increasing curiosity in 'those decrepit little objects' growing on our plant life. Long may it continue!

Records for 1998

A late arrival in my post was collected by Dan Hackett: this I understand was taken in a paddock in Tottenham (Grid Ref. TQ 350895) during the winter of 1995/6. The plant host was tansy *Tanacetum vulgare* (L.) and carried what proved to be *Rhopalomyia tanaceticola* (Karsch).

In Hyland Way, Hornchurch, Essex, on 7 January 1998 (TQ 527878), I noticed some distorted leaves of what I discovered were plants of *Laurus nobilis* (L.), but an ornamental variety with patches of cream in the leaf colour. It proved to be a plant louse (Psyllidae), *Trioza alacris* (Flor.).

A visit to Harrow Lodge Park, Hornchurch, Essex on 3 February 1998 (TQ 521863) gave me *Phytoptus triradiatus* (Nalepa) on *Salix alba* (L.), *Phytoptus avellanae* (Nalepa) on *Corylus avellana* (L.), *Neuroterus numismalis* (Geoffroy), sexual generation, *N. quercusbaccarum* (L.), also sexual generation, *Andricus kollari* (Hartig), sexual generation, *A. fecundator* (Hartig), sexual generation, and *A. lignicola* (Hartig), also sexual generation, all on *Quercus robur* (L.).

Crossing the car park on the north side of the Queen's Theatre in Hornchurch (TQ 539875) on 17 June 1998, a mature oak *Quercus robur* and an immature caught my attention, and examination showed *Neuroterus quercusbaccarum* (L.), asexual generation, *N. albipes* (Schenk), sexual generation, *Andricus curvator* (Hartig), asexual generation, and *A. inflator* (Hartig), sexual generation.

A visit was made by me to Motspur Park on 18 June 1998 to take part in a survey of the Beverley Brook. West Barnes Lane (TQ 224676) was visited along the bank of the river, and the following were found: the artichoke gall *Andricus fecundator* (Hartig), the oak apple *Biorrhiza pallida* (Olivier), asexual generation, *Neuroterus numismalis* (Fourcroy), asexual generation, *Cynips divisa* (Hartig), sexual generation, and *Andricus anthracina* (Curtis), sexual generation, all on *Quercus robur,* with *Aceria campestricola* (von Frauenfeld) on *Ulmus procera* (Salis.), and *Eriophyes goniothorax* (Nalepa) on *Crataegus monogyna* (Jacq.). A short walk to George Street (TQ 2267) found *Neuroterus quercusbaccarum* (L.) asexual generation, the common spangle gall, on oak *Quercus robur.*

In Osborne Road, Hornchurch (TQ 535880), on 19 July 1998 I found a few of the nail gall *Eriophyes tiliae tiliae* (Pagenstecher) reappearing on the lime *Tilia* × *europaea* (L.) after absence during the previous year. In the park at London Road, Romford (TQ 508885), on 14 September 1998, I found *E. tiliae tiliae* (Pagenstecher) again on the lime.

On 11 August 1998 at the junction of Grey Towers Avenue and Hornchurch Road, Hornchurch (TQ 535873), I found *Neuroterus quercusbaccarum,* sexual generation, again on *Quercus robur.*

Ray Softly sent me an interesting gall that he had found on 26 August 1998; it had been growing on wych elm *Ulmus glabra* (Huds.) on Hampstead Heath, where a leaf had been transformed into a large pouch: the aphid species is *Eriosoma (Schizoneura) lanuginosum* (Hartig).

Other records from places local to me in Hornchurch were on 5 July 1998 *Eriophyes tiliae tiliae* on *Tilia* × *europaea* on a street tree at junction of Windsor Avenue and Lyndhurst Drive (TQ 536877); on 9 July *Pontania proxima* (Lepeletier) on *Salix alba* (L.) outside Tesco's store at Roneo Corner, Romford (TQ 517875), and *Psyllopsis fraxini* (L.) on *Fraxinus excelsior* (L.) along Hornchurch Road (TQ 524874).

Dan Hackett sent me a specimen he had collected along Parkland Walk, near Stapleton Hall Road, Finsbury Park (TQ 315877) on 19 July 1998 and bearing *Neuroterus quercusbaccarum* and *Andricus anthracina* (Curtis) on oak *Quercus robur.* Also in July 1998, I took a specimen of *Aceria campestricola* (von Frauenfeld) on *Ulmus procera* (Salisb.) and a specimen of *Colopha compressa* (Koch) on the same tree in a hedge outside the house at 331 Norwood Road, SE24 (TQ 317732).

Roger and Elspeth Baxter wrote to say that a visit to Bookham Common, Surrey, on 10 October 1998, had enabled them to make collections: *Pontania proxima* (Lepeletier) on *Salix* × *rubens* (Schrank); *Aculops tetanothrix* (Nalepa) on *Salix caprea* (L.) (TQ 125560); *Urophora cardui* (L.) on *Cirsium arvense* (L.) Scop. (TQ 125560); *Diplolepis nervosa* (Curtis) the smooth pea gall, on *Rosa canina* agg., and *Rhabdophaga salicis* (Schrank) on *Salix cinerea* (L.) (TQ 124563), *R. salicis* on *Salix* sp. at TQ 125563, *Phytoptus avellanae* (Nalepa) on *Corylus avellana* (L.) at TQ 1256 with *Andricus anthracina* (Curtis) the oyster gall, *Biorhiza pallida* (Olivier) the oak apple gall, *Cynips quercusfolii* (L.), *Neuroterus albipes* (Schenk) the smooth spangle gall, *N. numismalis* (Geoffroy, in Fourcroy) the silk button spangle, and *N. quercusbaccarum* the common spangle gall, all on *Quercus robur* and widespread in the area.

The field trip to Grays Chalk Pit, an Essex Wildlife Trust reserve just a little north of the River Thames, led by Jerry Bowdrey of Colchester Museum on 26 September 1998, produced some interesting records: on *Quercus robur, Cynips divisa* (Hartig) the asexual generation, small and round; *C. quercusfolii* the cherry gall, also asexual generation; *Neuroterus quercusbaccarum* the common spangle, *N. numismalis* the silk button spangle, and *N. albipes* the smooth spangle, and also asexual generations. *Andricus anthracina* the oyster gall, *A. kollari* (Hartig) the marble gall, and *A. fecundator* (Hartig) the artichoke gall, all asexual generations. On *Acer pseudoplatanus* (L.) a common pouch gall *Artacris macrorhynchus* (Nalepa), on species of *Rosa,* robin's pincushion *Diplolepis rosae* (L.), the spiked pea gall *D. rosarum* (Giraud) and the smooth pea gall *D. eglanteriae* (Hartig). On a species of viola *Dasineura affinis* (Kieffer) was found. On species of willow *Salix* we had *Rhabdophaga marginemtorquens* (Bremi) and *R. heterobia* (F. Loew), *Iteomyia capreae* (Winnertz) and *Pontania viminalis* (L.). On stinging nettle *Urtica dioica* (L.), was *Dasineura urticae* (Perris). On blackthorn *Prunus spinosa* (L.) were *Eriophyes similis* (Nalepa), *E. padi* (Nalepa), *Pristiphora monogynae* (Hartig). On hawthorn *Crataegus monogyna* (Jacq.) we found *Eriophyes goniothorax* (Nalepa), and on dogwood *Cornus sanguinea* (L.) was *Craneiobia corni* (Giraud), whilst on alder *Alnus glutinosa* (L.) Vill. we had *Eriophyes inangulis* (Nalepa), on beech *Fagus sylvatica* (L.) we found *Hartigiola annulipes* (Hartig), and on hazel *Corylus avellana* (L.), big bud *Phytoptus avellanae* (Nalepa) completed the list, a total of twenty-seven species.

On the green opposite the Queen's Theatre, Hornchurch, in the car park (TQ 539875) in July 1998, I found *Psyllopsis fraxini* (L.) on leaves of the ash *Fraxinus excelsior,* a species which appears to be growing much more commonly over recent months. Catherine Schmitt sent me two specimens which she had gathered during a field trip to Black Park SSSI (TQ 005832) late in July 1998: one leaf bore the common spangle *Neuroterus quercusbaccarum* from one oak *Quercus robur,* the other leaf bore the silk button spangle *N. numismalis* (Geoffroy) from another oak a number of yards away. The latter species is really quite attractive, resembling a thread of golden brown wound round and round a circlet, and then placed on a small disc. On 3 August 1998, I again found on *Ulmus procera* (Salisb.) the pimply gall *Aceria campestricola* (von Frauenfeld) on the tree outside 331 Norwood Road, Tulse Hill (TQ 317732) showing that the mites causing the pimples have a secure hold so long as the tree lives.

Peter Harvey, a friend from Grays, Essex, sent me a flowering head of *Artemisia vulgaris* (L.) which he had found on 24 August 1998 at East Tilbury silt lagoons (TQ 6977): the specimen bore *Cryptosiphon artemisiae* (Buckton). Any reader who comes across plants of *Artemisia* should please look out for these drooping heads with crowded dwarf leaflets. It would be interesting to discover how common (or otherwise) this gall is. In Heath Park, Hornchurch (TQ 525881), which I rarely visit, on 29 September 1998, I found the twisted growth of *Pemphigus spyrothecae* (Passerini) on the pedicels of some leaves of *Populus nigra* (L.) var. *betulifolia* (Pursh.) Torrey. On 9 December 1998 I visited the B&Q superstore in Waterloo Road, Romford (TQ 517875) and looking over the trees planted around the outside, I found the gall *Pontania proxima* (Lepeletier) on a species of *Salix.*

However, the highlight of the year had to be the letter from Richard Carpenter telling me that he had found in August 1998 on Parliament Hill, Hampstead Heath, on a bud of oak *Quercus robur,* a gall later identified as that of the wasp *Andricus aries* (Mayr) (Figure 1), and now accepted onto the British list as new to this country (British Plant Gall Society 1999). It has since been reported by other observers, initially in the Hampstead Heath area, but more recently over the London area south of the Thames.

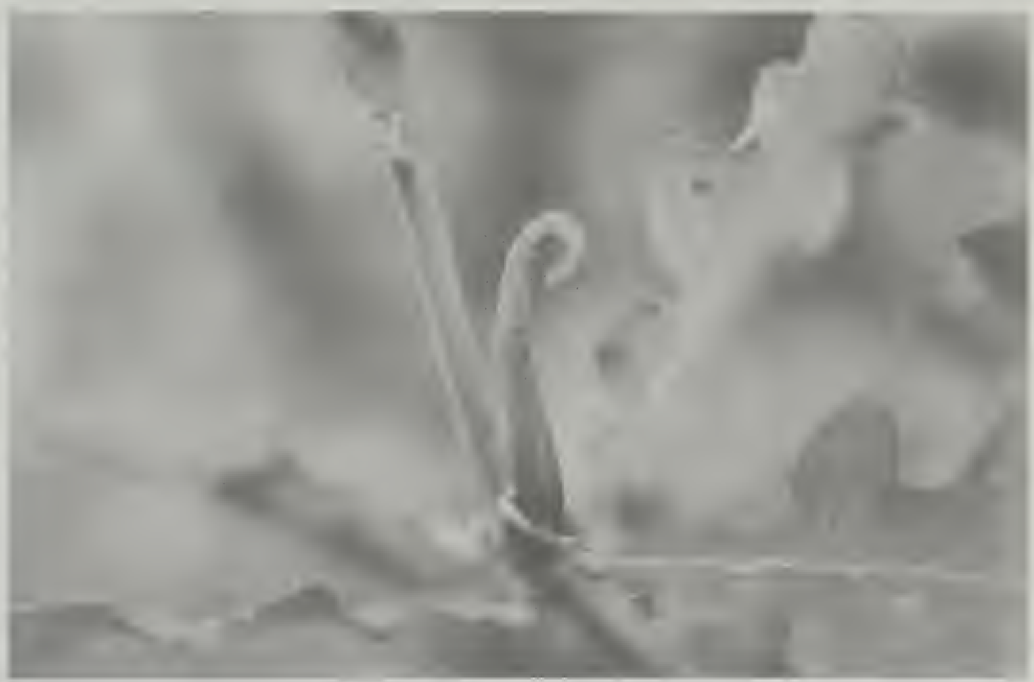

FIGURE 1. The ramshorn gall *Andricus aries* (Mayr), Parliament Hill, Hampstead Heath, 2 September 1998. *Photo: Richard Carpenter*

Records for 1999

A visit to the Royal Horticultural Society's Gardens at Wisley, Surrey, on 20 February 1999 showed me *Trioza alacris* (Flor.) on a plant of *Laurus nobilis* (L.) in the model gardens there. Once a gall has been found, it seems that as a general rule, that particular gall will be seen again on many an occasion! On 16 March 1999 whilst at Kew Gardens, Surrey, near the Herbarium, I noticed a tree of *Taxus baccata* (L.) bearing the early stage of the artichoke gall *Taxomyia taxi* (Inchbald).

Roger and Elspeth Baxter kindly sent me notes of galls that they had found in 1999: all were found in The Parade, Epsom, Surrey. In May on *Betula pubescens* (Ehrh.) was *Anisostephus betulinum* (Kieffer), in 3 July on *Acer pseudoplatanus* (L.) was *Artacris macrorhynchus* (Nalepa), whilst on 24 July *Neuroterus quercusbaccarum* was seen on *Quercus robur.* They also told of finding on Epsom Downs on 2 July on *Quercus robur* three galls, *Cynips longiventris* (Hartig), *Neuroterus tricolor* (Hartig), and *N. numismalis* (Geoffroy).

Catherine Schmitt again provided me with some records during the year. The first collection was made during a field trip to Broxbourne Woods, Hertfordshire (TL 324071) on 15 May: from oak *Quercus robur, Biorhiza pallida* (Olivier) the oak apple, *Andricus kollari* (Hartig) the marble gall, and *Cynips quercusfolii* (L.) were found, but more interesting of course, was that eyes were alert to *Centaurea nigra* (L.) the lesser knapweed carrying the gall *Urophora jaceana* (Hering) caused by a fly of the Tephritidae, which lays its eggs in the flower heads where they pupate after feeding on the plant tissues. Catherine's second trip was to Hampstead Heath (TQ 259866) on 22 August where the tephritid fly *Urophora cardui* (L.) had formed its bladder gall, and the following galls on oak *Quercus robur* were seen: the knopper gall *Andricus calicis* (Burgsdorf), the two spangle galls *Neuroterus numismalis* (Geoffroy, in Fourcroy) and *N. quercusbaccarum* (L.), the cherry gall *Cynips quercusfolii,* all of these being the agamic generation, plus the sexual generation of the oak apple gall *Biorhiza pallida* (Olivier), and on a twig, *Cynips quercusfolii* (L.) form *taschenbergi* (von Schlechtendal), sexual generation, and surprise!, on a bud, the hedgehog gall, very small but distinct, *Andricus lucidis* (Hartig) asexual generation. The rediscovery of this species in Britain was published by the British Plant Gall Society (1992) and was conveyed to me by Richard Carpenter as occurring on oaks on Parliament Hill and Pryors Field, Hampstead Heath, where he found it in 1999 (Figure 2).

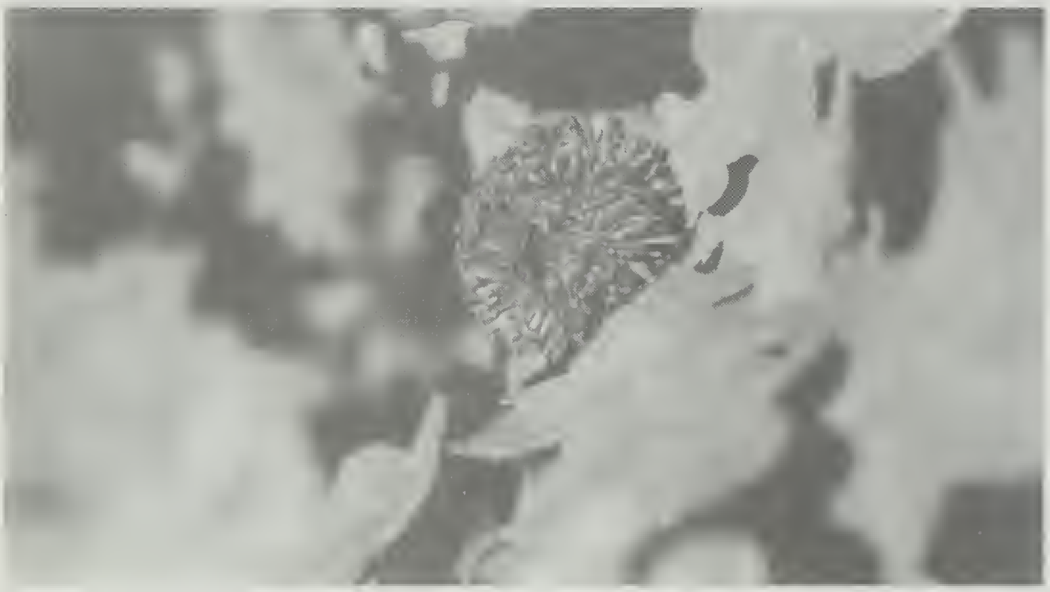

FIGURE 2. The hedgehog gall *Andricus lucidus* (Hartig), Parliament Hill, Hampstead Heath, 9 September 1999. *Photo: Richard Carpenter*

Catherine's next field trip was to Highgate Woods (TQ 283885) on 18 September: all of these records are from oak *Quercus robur*: *Andricus calicis* (Burgsdorf) which forms the knopper gall on acorns and carries a very sticky coating!, *Neuroterus numismalis* (Geoffroy, in Fourcroy) the silk button spangle, *N. quercusbaccarum* the common spangle, *Cynips quercusfolii* the cherry gall, *Andricus fecundator* (Hartig) the artichoke gall, *A. kollari* (Hartig) the marble gall, *A. lignicola* (Hartig) the cola nut gall, all the foregoing being the agamic generation, and *Biorhiza pallida* (Olivier) the oak apple gall and sexual generation.

In Link Way, Hornchurch (TQ 544871) on 19 May 1999 I found a street tree, *Prunus amygdalus* (Batsch) the almond, bearing leaf infestation by the fungus *Taphrina deformans* (Berk.) Tul. Outside the health clinic in Westland Way, Hornchurch (TQ 541873) on 19 May I found *Aceria macrorhyncha cephalonia* (Nalepa), on *Acer pseudoplatanus* (L.), whilst in Billet Lane, Hornchurch (TQ 539874) in September 1999, I found the agamic generation of *Andricus kollari* (Hartig) on *Quercus robur* and *Psyllopsis fraxini* (L.) on *Fraxinus excelsior*.

Margo Nagle was kind enough to send me on 8 May a specimen found on *Prunus spinosa* (L.) found on Hampstead Heath during a field trip; it was an example of the starved plum caused by the fungus *Taphrina pruni* (Tul.). On 8 June I found camellia-like galls on shoots of several of my redcurrant bushes, Elmhurst Drive, Hornchurch (TQ 531876). A search showed a number of ants running around amongst a number of grey-green aphids. My identification of the aphid as *Aphis schneideri* (Boerner) has been confirmed by John Robbins of the British Plant Gall Society. There are one or two other species of aphid that also feed on members of the genus *Ribes,* and other species of currant should also be searched; all is of interest and helps to increase knowledge.

Roger and Elspeth Baxter sent me some specimens collected at Bookham Common on 12 June 1999 and also mentioned sightings of a few more. The lime tree has since been identified for them as *Tilia americana* (L.), the gall being *Eriophyes tiliae tiliae* (Pagenstecher), a nail gall (TQ 125561). Another specimen was the gall *Eriophyes similis* (Nalepa) spp. *prunusspinosae* (Nalepa) on *Prunus spinosa* (L.) found at TQ 121561. On meadowsweet *Filipendula ulmaria* (L.) Maxim. was found the gall *Dasineura ulmariae* (Bremi) at Merritt's Cottage (TQ 124563). Looking in their garden at The Parade, Epsom (TQ 121606) on 13 June they found *Diplolepis nervosa* (Curtis) on *Rosa canina* (L.).

Roger and Elspeth Baxter made another trip to Bookham Common on 10 July where the following galls were noted: at TQ 125560 *Pontania proxima* (Lepeletier) on *Salix fragilis* (L.); at TQ 130560 *Andricus fecundator* (Hartig) the artichoke gall on *Quercus robur* (L.); at TQ 131560 *Andricus quercuscalicis* Burgsdorf); at TQ 125564 *Andricus fecundator* (Hartig), both also on oak *Quercus robur*. They kindly sent me specimens that they had collected as follows: on *Tilia platyphyllos* (Scop.) was *Aceria exilis* (Nalepa) at TQ 125460 and at the same site on *T. platyphyllos* was *Eriophyes leiosoma* (Nalepa); on *Tilia cordata* (Mill.) was *Eriophyes tiliae tiliae* (Pagenstecher) at TQ 126560; at the same site and also on *T. cordata* was *Eriophyes lateannulatus* (Schulze) and *Eriophyes leiosoma* (Nalepa), whilst on *Carpinus betulus* (L.) was *Zygiobia carpini* (Loew) at TQ 126560 also at the same site and on *Acer campestre* (L.) was found *Aceria macrorhyncha macrorhyncha* (Nalepa); at TQ 127561, on *Juncus × surrejanus* was collected *Livia juncorum* (Latreille) — this rush is the hybrid of *Juncus acutiflorus* and *J. articulatus*. At TQ 125564 on *Salix aurita* (L.) was found *Iteomyia major* (Kieffer); at TQ 125566 on *Salix × multinervis* (Doell) *Euura venusta* (Zaddach) was found.

Margo Nagle sent me some galls to look at in July 1999. Two were on elm, *Ulmus* sp. and were of the pouch gall *Aceria campestricola* (von Frauenfeld) obtained on Hampstead Heath (TQ 2687). Margo also sent me a specimen from Twickenham (TQ1572) on *Rubus* sp.; this I identified as caused by the mite *Eriophyes gracilis* (Nalepa). A visit to Harrow Lodge Park, Hornchurch, on 3 August produced for me on *Acer campestre* (L.) *Aceria macrochela macrochela* (Nalepa) and *Aceria macrorhyncha macrorhyncha* (Nalepa); on *Fraxinus excelsior* (L.) was *Psyllopsis fraxini* (L.); on *Prunus spinosa* (L.) was *Pristiphora monogyniae* (Hartig); on *Quercus robur* (L.) was *Andricus anthracina* (Curtis), *Andricus kollari* (Hartig) and *Neuroterus quercusbaccarum* (L.), whilst I found on *Salix alba* (L.) *Iteomyia major* (Kieffer) and *Pontania proxima* (Lepeletier).

Catherine Schmitt kindly sent to me from Hampstead Heath (TQ 259866) two specimens that she collected there on *Cirsium arvense* (L.) Scop.: *Urophora cardui* (L.), a tephritid fly, and on a twig of *Quercus robur, Cynips quercusfolii* form *taschenbergi* (von Schlechtendal) sexual generation **and** *Andricus lucidus* (Hartig) the agamic generation, which has been mentioned above as being found by Richard Carpenter! Catherine's gatherings were made on 22 August 1999.

Margo Nagle sent me two more specimens she had collected from Hampstead Heath, of *Neuroterus quercusbaccarum* and *Andricus fecundator* (Hartig).

My wanderings around Hornchurch, my local borough, have shown me how common so many of our galls are: the following were all found in TQ 5387 during September 1999. On *Tilia platyphyllos* (Scop.), *Eriophyes exilis* (Nalepa), *Eriophyes tiliae tiliae* (Pagenstecher) and *Eriophyes leiosoma* (Nalepa). On *Sorbus aria* (L.) Crantz, *Eriophyes sorbeus* (Nalepa). On *Fraxinus excelsior, Psyllopsis fraxini* (L.). On *Ilex aquifolium* (L.), *Phytomiza ilicis* (Kaltenbach). On *Quercus robur, Neuroterus quercusbaccarum* and *Andricus lignicola* (Hartig). Also found during the same month, but much less common, on *Laurus nobilis* (L.) which can be a mature tree in an ornamental garden, or as a small standard or pot bush used for cooking, was the gall *Trioza alacris* (Flor). Another is on *Forsythia intermedia* (Zab.) bearing *Corynebacterium fascians.*

Gavin Hawgood sent me a specimen collected in Hornsey Churchyard, north London (TQ 303892) on 29 September from *Ulmus* sp. and it was *Eriosoma lanuginosum* (Hartig) which is a bug of the family Eriosomatidae.

Roger and Elspeth Baxter sent me further gatherings from Bookham Common, collected on 9 October. At TQ 125560 on *Quercus robur* on a leaf were *Neuroterus numismalis* (Fourcroy), *N. albipes* (Schenk) and *N. tricolor* (Hartig). At TQ 121565, also on *Quercus robur,* was *Neuroterus tricolor* (Hartig) with *N. quercusbaccarum* and *N. numismalis* (Geoffroy, in Fourcroy). At TQ 119564 were *N. quercusbaccarum, Neuroterus albipes* (Schenk), *N. numismalis,* and *Andricus fecundator* (Hartig). At TQ 120565 on *Cirsium arvense* (L.) Scop. was *Urophora cardui* (L.). At TQ 120564 on *Q. robur* was *Andricus kollari* and at TQ 119564 on *Veronica chamaedrys* (L.) was *Jaapiella veronicae* (Vallot). This gall has also been found in their own lawn on the same host at TQ 121606 in The Parade, Epsom, Surrey.

Dan Hackett sent me a gall he had collected whilst at Minsmere, Suffolk, on the weekend of 6/7 November 1999. Although this is *not* an LNHS record, I feel it should be mentioned as of interest, in case it may be found within our area. It was on *Glechoma hederacea* (L.) and is *Rondaniola bursaria* (Bremi) and occurs as small blemishes/pustules on the upper leaf surface.

The last specimens received during the year, also from Roger and Elspeth Baxter, were two specimens from Bookham Common. The first was collected at TQ 130564 on 11 December, on the male fern *Dryopteris filix-mas* (L.) Schott, and is *Chirosia betuleti* (Ringdahl), whilst the second one is from TQ 126561 on *Betula pubescens* (Ehrh.) and is *Semudobia betulae* (Winnertz), collected on 16 December.

Corrections to report for 1996 and 1997

It is understood that records of *Aphis ilicis* (Kaltenbach) on *Ilex aquifolium* (L.) are still required, as the point about whether it is a true gall or not has not yet been settled.

Under the heading 'Records to date' paragraph beginning 'The Ecology and Entomology Section's visit', the gall named as *Rhabdophaga heterobia* (Loew) was in fact *Rhabdophaga rosaria* (H. Loew).

Doubt has been cast on the specimen of *Petroselinum segetum* (L.) Koch, corn parsley, which bore a gall whose name I was unsure about. I must try to find some fresh specimens, earlier in the season.

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Book review

The liverwort flora of the British Isles. Jean A. Paton. Harley Books, Colchester. 1999. 626 pp., A4, 314 multiple text figures. £52.50 hardbound, ISBN 0 946589 60 7.

There is a rich flora of liverworts in this country which is largely unknown and unappreciated by the average naturalist. These primitive plants may be either of the thalloid or leafy kind, the latter being especially delicate and intricately formed. They have a natural beauty and diversity of form which is fascinating to those who attempt to study them.

This volume, *The liverwort flora of the British Isles* is a large heavy book suitable for study at the desk and describes each of the 300 or so species plus the subspecies and varieties in great detail with accompanying line drawing illustrations, usually one A4-size page per species. The book incorporates the great wealth of knowledge and expertise of Mrs Paton, obtained over many years' practical experience in the field and compiled with constant updating over thirty years. It is for amateur and professional bryologists alike a long-awaited source of information in detailed descriptions and illustrations giving the means to identify species of this group. It will not disappoint them.

Where so much variety can be found the inclusion of habitat variations in the descriptions and illustrations is invaluable and the quality and clarity of the line drawings is such that a feel for the volume and character of the plant may be obtained and the intricate features studied.

Keys are given for establishing genera and for distinguishing species, and there are sections on the practical examination of plants by lens or microscrope which are very helpful, as also are the suggestions on storage of herbarium specimens. There are no distribution maps but there are detailed notes on the preferred habitat and ecology of each species which are a major contribution to our knowledge of these plants and reflect the author's long practical experience in the field.

This is a beautiful book and for novice or expert it offers a far better conception of the individual plant form than that of previous floras. It is inexpensive for the major work that it is and it will be the definitive flora of hepatics for decades to come. The illustrations are exceptionally good and I am not surprised that this was recognized when Mrs Paton received the Jill Smythies Award from the Linnean Society of London in May 2000 for her illustrations in this book.

CHRISTINE RIESER

Spider records for London and Middlesex counties in 1999

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Abstract

New and interesting spider records for the London Area in 1999 are detailed. There were six new county records for Middlesex including one Nationally Notable A species, but none for London.

Introduction

Survey work was somewhat reduced in 1999, although the monitoring of spiders in Queen's Wood continues. A report on the first ten years of spider trapping in Queen's Wood is in preparation and hopefully will be ready for *The London Naturalist* in 2001.

A few new sites were investigated, in particular Bushy Park where a single visit in May to the unmown and deer-grazed area in the west of the Park produced several interesting records, as did a number of visits to a derelict site (including grassland, scrub and some secondary woodland) adjacent to the North Circular Road and the main railway line from King's Cross. This site is known as Bounds Green Wilderness.

In total 103 species were recorded in London and Middlesex counties in 1999 (compared with 107 species for 1998 and 155 for 1997), of which six were new new records for Middlesex, although no new records for London were found. The total species list for Middlesex has now reached 276.

Nomenclature used is according to Merrett et al. (1985) with amendments by Merrett and Millidge (1992) and Nellist (1998).

In the list below the species marked ** are new records for Middlesex.

DICTYNIDAE

Nigma walckenaeri. This green spider had been recorded at nine localities in London and Middlesex but is not often seen. In October 1999 a single female was found hiding under the bark of a mature sycamore tree in Tottenham Cemetery, this being only the sixth site in Middlesex from which it has been recorded.

PHILODROMIDAE

***Thanatus striatus.* A first record anywhere in London or Middlesex for this characteristic crab-spider was an adult female taken in mature grassland in the unmown part of Bushy Park.

SALTICIDAE

***Euophrys herbigradus.* While *Euophrys frontalis* is common in the London Area, the closely related but much rarer *E. herbigradus* (Nationally Notable A species) had not previously been recorded. In 1999 two females were taken among grass at Bounds Green Wilderness in June and several other immature jumping spiders apparently of the same species were seen.

LYCOSIDAE

***Alopecosa cuneata.* This spectacular wolf-spider is common in Richmond Park, and also at Priors Field on Hampstead Heath (inside the old county of London), but in 1999 specimens of both sexes, the first records for Middlesex, were collected in Bushy Park.

THERIDIIDAE

Episinus angulatus. This unusual spider with a triangular abdomen is often associated with heather, but in 1999 it was found at two new sites in Middlesex (it was only known previously from Pond Wood); Alexandra Park and Bounds Green Wilderness. In both places the habitat was long grass in rather damp areas — at Alexandra Park this was at the edge of the pond in the Conservation Area.

***Steatoda phalerata.* Another spectacular species, *Steatoda phalerata* was taken in the unmown deer-grazed grassland in Bushy Park — a very similar habitat to Richmond Park just across the river in Surrey, where it is fairly common in the drier areas.

ARANEIDAE

During 1999 new localities for three relatively uncommon smaller orb-web spiders were found. Bounds Green Wilderness became only the fourth known site in Middlesex for the attractive *Ageleneta redii* when a single male was swept from bushes in May, and in the same month a male *Araniella opisthographa* was swept from dense stream-side herbage at Brunswick Park in Southgate (the third recorded site in Middlesex for this species). Finally, several specimens of both sexes of *Hypsosinga pygmaea* were swept from long grass in Bushy Park, also in May.

LINYPHIIDAE

Walckenaeria cuspidata. In July a single female was trapped in Queen's Wood during the ongoing spider monitoring. *Walckenaeria cuspidata* is commoner in northern parts of the country where it can be quite common. Although it was recorded from Middlesex (locality unspecified) by Locket et al. (1974) twenty-five years ago, the only recent Middlesex record was a single individual found at The Paddock, Tottenham in 1996 (Milner 1997), while in London county it has also been recorded from Kenwood and Camley Street Nature Park, both in 1985.

***Diplocentria bidentata.* This small linyphiid is more usually found on heathland and in mountains. The first record for either London or Middlesex was a single female trapped in Queen's Wood in July 1999. Like a number of other species this was the first individual found in over ten years trapping at six sites in the Wood and is something of a puzzle. Until further specimens are found its status as a member of the Queen's Wood spider fauna must be regarded as problematic. The same applies to the following species.

***Centromerus arcanus.* Another species found more commonly in the North, but represented by scattered records across England is the small linyphiid, *Centromerus arcanus.* In 1999 a single female was trapped in Queen's Wood in the June/July period.

Acknowledgement

I would like to thank Mike Roberts for confirming the identification of some of these specimens.

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The status of the spider *Zilla diodia* (Walckenaer, 1802) (Araneae: Araneidae) in south-eastern England

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Abstract

The status and distribution of the Nationally Scarce spider *Zilla diodia* in south-eastern England is discussed in relation to the London Natural History Society's recording area.

The record of a single male of the orb-web spider *Zilla diodia* from Buckingham Palace Garden in May 1996 (Milner 1999) prompts me to place on record in this journal a number of records from the London Area which were evidently not available to that author at the time of writing.

The Nationally Scarce, Notable B (Ball 1986) spider *Zilla diodia* (Walckenaer, 1802) is confined to the southern half of England and is known from Devon, Somerset, Dorset, Wiltshire, Hampshire, Isle of Wight, Surrey, Sussex, Kent, Hertfordshire, Bedfordshire, Essex, Suffolk and Worcestershire. For spiders, the cut-off point for Notable status was considered to be species recorded in an upper limit of sixteen counties, this being roughly equivalent to 100 ten-kilometre squares (Merrett 1990). With the publication of a provisional atlas of British spiders at the end of 2001, the result of data collected by the Spider Recording Scheme since its origin in 1987, a more accurate appraisal of status should become possible.

Zilla diodia is found on tall heather, brambles, bushes and the lower branches of trees, usually in sheltered shady places and among scrub on cliffs by the coast. It occurs at the edge of clearings or rides in deciduous or mixed woodland, in old hedgerows, green lanes, scrub and sometimes gardens. Immatures can be beaten out of scrub and hedgerows in late autumn but have also been found in litter at that time of year. The species has distinctive silvery-white markings on the abdomen which overhangs and sometimes completely obscures the carapace (Figure 1). The vertical web has no signal-line or retreat and the spider waits for prey at the centre of the web. If disturbed it will drop on a silken line. Specimens which may be of this species should be sent to the relevant Area Organizer of the Spider Recording Scheme for confirmation or to the author, the National Organizer.

This spider is evidently widespread in some counties and may be abundant where found. It is particularly frequent across the southern and eastern parts of Essex with many records within the London Natural History Society's (LNHS) recording area (e.g. Harvey 1990, 1991, 1992, 1998). Elsewhere in the London Area there are records in Surrey (Askins 1992), Kent, Hertfordshire and Middlesex. The author has found the spider to be abundant at some sites in Surrey and to occur regularly in a suburban garden at Surbiton, just outside the modern Greater London boundary. The spider has also occurred regularly in the author's old and present gardens at Grays in South Essex. Figure 2 summarizes the data available for the LNHS recording area.

In much of Middlesex, Hertfordshire, Surrey and Kent the species is likely to be under recorded. Figure 3 summarizes the data for the south-east England region which are currently available to the author. When data from the Spider Recording Scheme become available it is likely that there will be further records of *Zilla diodia* within the area covered by Figure 3. However the absence of the spider from north-west Essex, despite extensive fieldwork and good coverage of the whole county, suggest that the absence of records in the north of the region may be real.

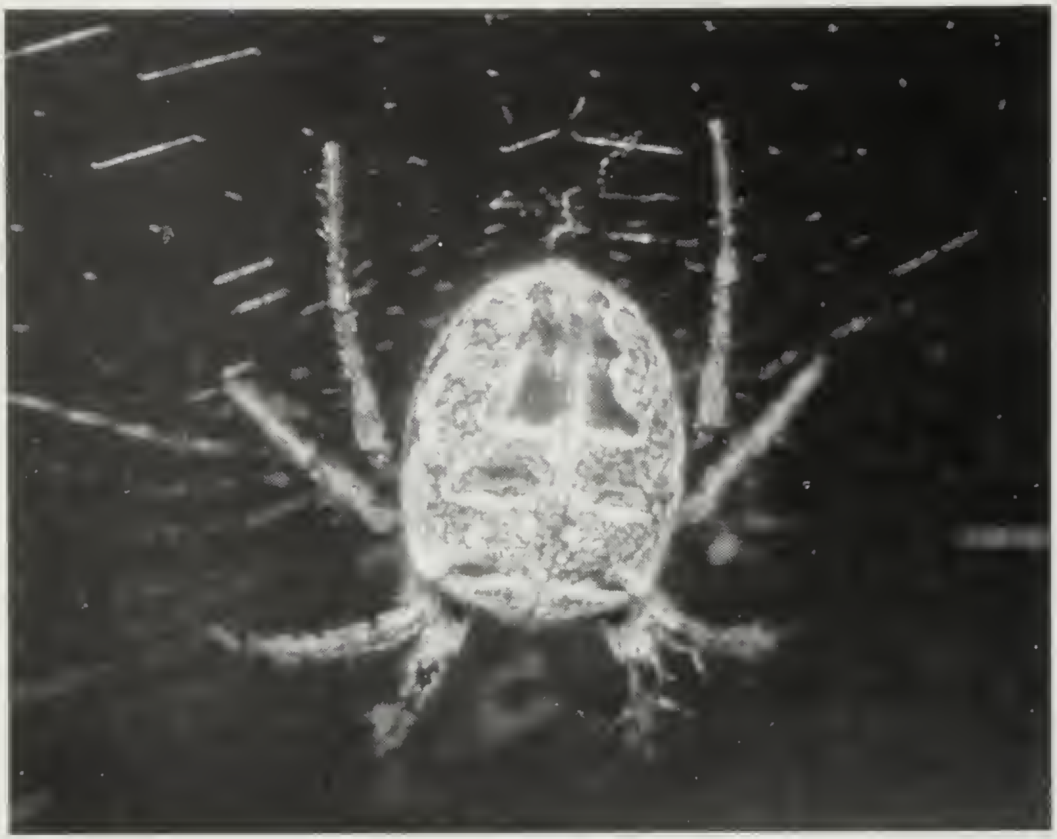

FIGURE 1. *Zilla diodia* on web.

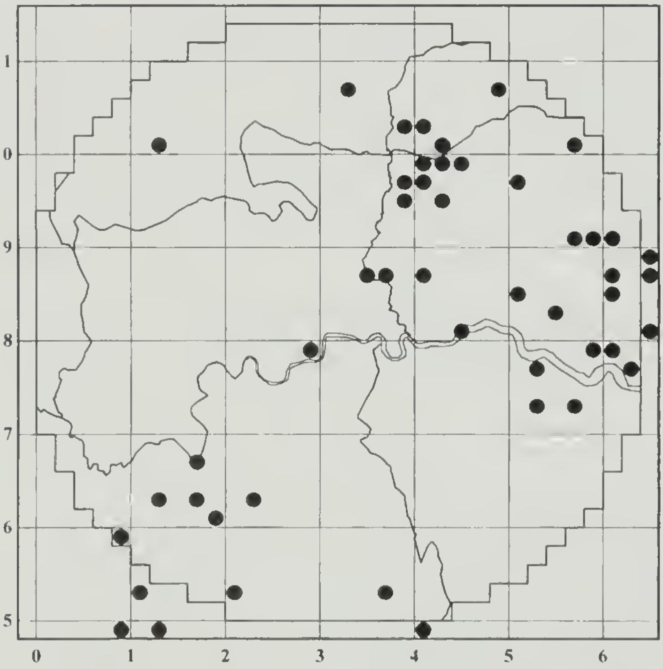

FIGURE 2. Records of *Zilla diodia* in the squares which include the LNHS recording area.

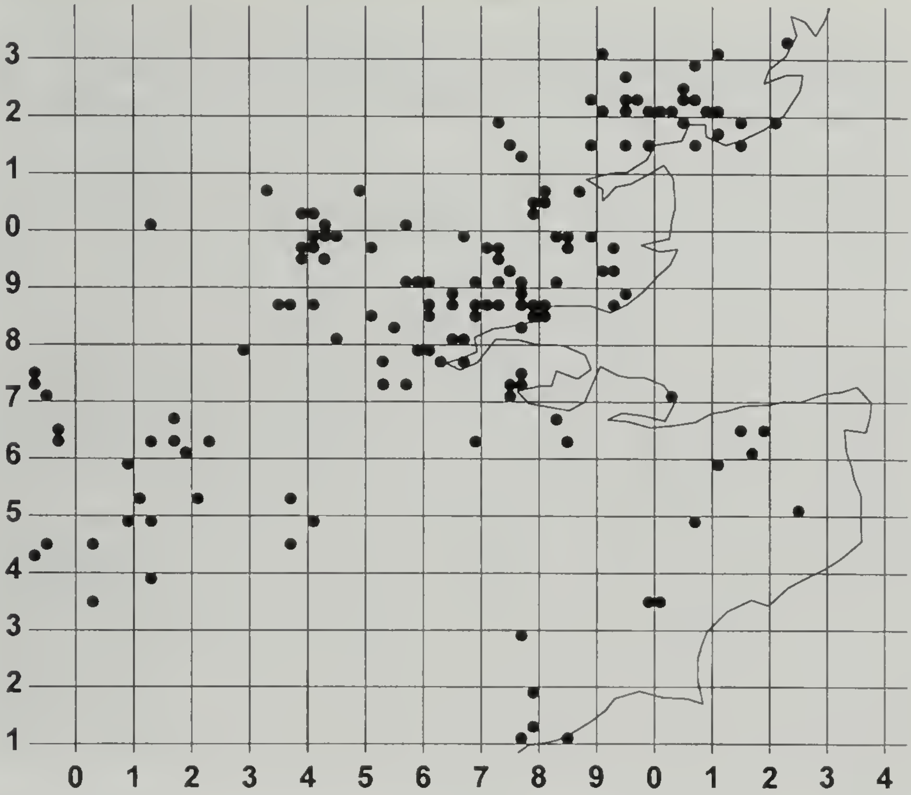

FIGURE 3. Records of *Zilla diodia* in the south-east England region.

Acknowledgements

Maps have been produced using DMAP, a mapping program developed by Dr Alan Morton. The author is grateful to David Carr and Ray Ruffell (in the Essex Spider Group), Martin Askins, Eric Philp and David Nellist for making available their records of *Zilla diodia*, and to Colin Plant for helpful suggestions on the draft.

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Book review

A fly for the prosecution. How insect evidence helps solve crimes. M. Lee Goff. Harvard University Press. 2000. 226 pp. £15.50 hardbound. ISBN 0 674 00220 2.

Generally speaking I am not a great one for the personalized American style of writing, though that is just a personal preference. However, after reading the introductory chapter of Dr Goff's book I was immediately hooked. Unfortunately, work commitments prevented me from continuing the read through for several weeks until I sat down one evening to watch the television with my two offspring. The programme we were watching was concerned with forensic aspects of murder investigations. Suddenly, there on the screen before me was Dr Goff — who is Professor of Entomology at the University of Hawaii, and Consultant in Forensic Entomology to the Honolulu Medical Examiner — extolling the virtues of maggots as agents for solving the difficult problem of placing a time of death on the badly decomposed body of a murder victim. The programme was fascinating and I determined to pick up the book again. I did so the next day, and very quickly found the same case history there that had been presented on the television the night before. The few discrepancies I put down to poor video-editing!

The book is full of case-histories in which insects, in one form or another, have helped convict murderers in Hawaii. In particular, the use of insects to calculate the post-mortem interval (time lapse between death and discovery), is emphasized. The process is not simply a matter of knowing how long a particular fly larva on the body has been there. The interval is complicated by factors such as how long it actually takes a particular species of fly to find the body, and how is this period affected by seasonal temperature variation, by whether the body is naked, or completely wrapped, or by other factors. In many cases, the answer to a particular problem may not be known and Dr Goff describes the experiments performed to find out. These generally tend to involve obtaining a dead pig and using it in his garden to duplicate the situation in which the body was found. And my neighbours think I am weird!

Dating decomposed bodies is not the only use of insects in forensic entomology. Maggots taken from a body can be analysed for poisons, for example. Personally, however, I particularly liked the case in which the remains of a grasshopper were found with a body. The grasshopper was missing its left hind leg; nobody gave the insect any great thought, but it was routinely collected in any event. When the suspect was caught and searched, the left hind leg of a grasshopper was found in his trouser turn-up. Microscopy showed that the fracture on leg and insect matched perfectly! The suspect was subsequently convicted.

Although somewhat autobiographical, the book is a serious attempt at enlightenment, aimed at the various law-enforcement agencies around the world that are not aware of the great benefits of forensic entomology.

It is not a text book, but it is a jolly good read in which a great wealth of factual information is effortlessly transferred from page to brain. The considerable enthusiasm of Lee Goff, who clearly loves his job as much as his Harley-Davidson motor-cycle, is evident throughout. As Christmas approaches yet again, I can thoroughly recommend this book to anyone with even a passing interest in insects.

COLIN W. PLANT

Spiders in London: observations on their occurrence, phenology, habitat preference and response to disturbance, from the results of 82 12-month pitfall samples

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Abstract

The results of 82 12-month pitfall samples taken over a period of ten years in open spaces throughout the London area are analysed. Altogether 167 species were trapped and these are listed with monthly totals. The trap samples are separated by habitat and disturbance level. A number of factors influencing the occurrence, distribution and abundance of spiders are discussed, and a number of pioneer species identified. As a result some conclusions about the autecology of the most common species are made. Some advantages of 12-month trapping are discussed and a number of suggestions made about the value of future studies of this kind to assess the conservation value and appropriateness of management of sites. Its potential role is also discussed in the context of monitoring changes in the spider fauna such as those expected due to climatic change.

KEYWORDS: spiders, pitfall-traps, autecology, phenology, invertebrate conservation, grassland ecology, woodland ecology, ecological monitoring, climate change.

Introduction

Spiders often make up a substantial proportion of the invertebrate population in most terrestrial habitats; their diversity and the variety of often precise ecological and phenological strategies they exhibit make them useful indicators of the prevailing environmental conditions. In urban and peri-urban sites spiders can be one of the most useful groups for assessing the relative conservation value of different areas, or changes in environmental conditions between sites or over time. Monitoring spider populations may prove to be a particularly sensitive way of measuring effects such as those thought to be associated with global warming. However, to make use of such observations, an appropriate set of baseline data is necessary. This paper is an attempt to provide a contribution in this direction by aggregating the results of a number of surveys conducted in the London area over the past few years using a standardized sampling procedure.

Starting with a survey at Alexandra Park in Haringey more than ten years ago (Milner 1987), the author has conducted a number of spider studies based on a standardized pitfall-trapping procedure in most of the major open spaces within the conurbation of London. While pitfall-trapping has limitations in terms of assessing the total spider fauna, it is a valuable tool for standardized sampling of ground-active spiders allowing both comparison between sites and monitoring over extended periods. '*Spiders can easily be collected by quantitative and qualitative methods . . . pitfall traps are by far the most common method of collecting.*' (Hanggi et al. 1995). Pitfall results are also useful in separating ecologically and phenologically some of our commonest and most abundant species.

Nomenclature used is according to Merrett et al. (1985) with amendments by Merrett and Millidge (1992) and Nellist (1998).

Materials and methods

The methods used have been detailed in a number of previous papers such as Milner (1987). Trios (within a circle 1 m in diameter) of standard polythene traps were set so that the lip of each trap was roughly at the upper surface of the mineral soil. A small piece of plastic garden grille (of squares about 1 cm) was placed on top of each trap to restrict the accumulation of leaves and other debris and to prevent as far as possible entry by larger animals such as voles and frogs. Each trap contained about 4 cm of commercial anti-freeze to which had been added a small quantity of 4 per cent formalin solution and some household detergent as a wetting agent. Where practicable 'roofs' made of folded pieces of zinc sheet were used to keep out rain, but this was not possible in open sites where vandalism (by people and apparently also by dogs and even by foxes) influenced the effectiveness of the traps.

The traps were emptied on a monthly basis, by straining through a piece of stocking fabric, and the catches were then washed and sorted. For each catch a 'census date' was given, being the mid-point of the trapping period. The trapping took place between 1985 and 1996 with starting dates from 16 June 1985 to 6 June 1995.

The trap sites

A list of the sites sampled is given in Table 1a–g. The sites chosen at each main location in general represented the range of the habitats available in the larger open spaces. However, the set of samples should not be considered as statistically representative of the available grassland and woodland sites available in the London area. One garden (lawn) site is included but all other sites are in parks or wilder public open spaces. The sites were chosen to represent the diversity of available habitats, but the highly disturbed and altered sites — those referred to by Dr Eric Duffey (pers. comm.) as 'recreation ground habitats' are actually under represented in the set as a whole. Wetter sites are also somewhat under represented as they tend to flood and therefore often need more frequent emptying than was possible in most of these cases.

At each trap site the major characteristics were recorded including vegetation, susceptibility to waterlogging, degree of shading, etc. For grassland, short grass was taken as below 10 cm as the main sward level (Frontispiece). Grassland was taken to include grassy patches in glades or smaller canopy breaks within woodland (Figures 1–3, pp. 132, 140, 142), while woodland vegetation was taken to be denser vegetation such as brambles *Rubus* spp. or ivy *Hedera helix* shaded by the tree canopy. The scrub category was used for sampling sites under gorse *Ulex* spp. bushes (Frontispiece), dense bramble *Rubus* spp. not in woodland, and stands of tall herbs such as willow herb *Epilobium hirsutum* without a tree canopy above them. These should perhaps all be seen as either 'woodland edge' or 'grassland edge' habitats.

The level of disturbance (by trampling, mowing or vandalism) at the different sites was estimated in a very basic way from the frequency of trampling and damage to the traps or trap-sites.

Three levels were recognized:

0 = low (no recorded disturbance of trap-site).
1 = medium (below 12 individual trap disturbances per year).
2 = high (12 or more trap disturbances per year (i.e. every month).

The grassland sites were distributed as follows:

Habitat	**Disturbance level**			**Total**
	0	1	2	
Short grass	—	4	5	9
Long grass	5	10	1	16
Shaded grass	3	6	1	10
Totals	**8**	**20**	**7**	**35**

A further factor which intuitively appeared to be influential was the apparent degree of naturalness of the vegetation. This is related to the level of disturbance and eutrophication — where disturbance is high the vegetation tends to change in favour of vigorous invasive plant species at the expense of plant diversity and especially the finer and often slow-growing species. Some sites, such as Barnes Common and some of the Hampstead Heath sites, still retain a diverse flora (often dominated by bent grass *Agrostis tenuis*) and have not been invaded by the more vigorous species associated with eutrophication — these sites are indicated by * in Table 1.

During the period represented by the data set, some sites changed in structural diversity due to alterations in the local management — notably some sites on Hampstead Heath where mowing regimes come and go. So as not to bias the sample towards a particular management regime two sets of samples (four years apart) were included from four sites: these are sites 5 and 14, 6 and 17, 20 and 21, and 80 and 81 (see Table 1). In each case the earlier sample dates from a period when nearly all the grassland on the Heath was regularly mown, while the later samples are from a period when for various reasons mowing had been abandoned almost completely and did not affect the pitfall sites at all.

Results

Pitfall traps are not universally accepted as accurate means of sampling even ground-active spiders, especially when comparisons are made between sites where the vegetation has different structural characteristics. However, apart from destructive techniques (which clearly cannot be used to sample over time) there are no genuinely replicable sampling methods for spiders which are any better or more reliable.

The species sampled are clearly only the ground-active ones. However, as Duffey (pers. comm.) has pointed out, not all species are 'equally catchable in pitfall traps' — some common species such as *Hahnia nava* seldom fall into pitfalls. In addition a number of sources of inaccuracy must be noted at the outset.

Highly disturbed sites and sites in short grass suffer more frequent vandalism, and most of the grassland sites suffered damage at one time or another from mowing. In periods of wet weather some traps become waterlogged and for varying periods fail to function properly. However, the importance of these problems may be over estimated in the context of 12-month 3-trap samples.

The data include samples taken over a ten-year period during which 'natural' changes (e.g. climatic changes) may have occurred and there have also been some changes in the management of a number of the sites sampled: for example much of the grassland on Hampstead Heath had the mowing regime reduced over the period of the study. However, partly to take this into account two pairs of samples have been included from a period when the sites were mown (sites 23 and 83 — for site numbers see Table 1a–g) and from four years later after mowing had been relaxed for three seasons (sites 24 and 84). The author has previously reported on some of the changes noted at these and other sites on Hampstead Heath (Milner 1993, 1994*a*).

Overall results

In total 33,217 spiders representing 167 species (approx 27.5 per cent of the British fauna) were trapped in the 82 12-month samples, giving means of 405 spiders representing 25.9 species (species richness) per sample (Table 2a). The range at different sites was considerable both in numbers and species richness. Several grassland samples produced over 1,500 spiders in 12 months while two of the samples in deep woodland litter produced less than 100 spiders. Species richness varied from just 10 (in deep woodland litter) to 45 in undisturbed grassland inside the Bird Sanctuary at Hampstead Heath. A list of trap sites, grouped according to habitat, with start dates, spider catches and disturbance level is given in Table 1a–g.

A complete species list is given in Table 5, which also gives aggreggate numbers for each 'census month' (see Phenology below), but a complete breakdown of species for each of the 82 sites is not included here, but may appear at a future date.

As expected, most of the species recorded were common species, with *Pachygnatha degeeri* and *Oedothorax fuscus* (both grassland species) being the most abundant, making up 12.1 per cent and 9.8 per cent of the total catch. However, in terms of frequency of occurrence *Lepthyphantes tenuis* was well ahead of the other species, being recorded from 73 of the 82 samples (89 per cent), with the next three species being *Walckenaeria acuminata* (62 samples), *Microneta viaria* and *Lepthyphantes flavipes* (both 61 samples).

At the other end of the scale there were two *Red Data Book* (*RDB*-3) species (*Enoplognatha oelandica* and *Tapinocyboides pygmaeus*), one Notable A species (*Wiehlea calcarifera*) and three Notable B species (*Centromerus incilium, Coelotes terrestris,* and *Lepthyphantes insignis*), as well as the newly described *Porrhomma cambridgei.* A total of 32 species each occurred as a single individual in one of the 82 samples. Some of these were clearly accidental catches such as *Araneus diadematus* and *Tegenaria domestica,* but many were species that are apparently rarities in the London area (e.g. *Porrhomma campbelli, Agyneta conigera* and *Micrommata virescens*).

Habitat differences

As the figures for catches at the different sites (Table 1a–g) grouped by habitat show, spider totals and species richness vary considerably. These findings are summarized in Table 2.

The numbers of spiders were generally much higher in grassland, especially where the grass is relatively short — indeed the mean numbers gradually increase from woodland litter, through woodland vegetation and 'scrub' (the woodland/grassland overlap or edges), shaded grassland and long grass to the highest numbers where the shade is the least. This may be directly related to the abundance of suitable prey. Annual catches in short grass averaged more than four times the mean for woodland litter and the means for all grassland and all woodland were 647 to 209 respectively.

In terms of species richness the differences between the various habitats are relatively less with the grassland sites averaging about 50 per cent more species than the woodland sites, and the long grass sites having the highest mean score (Table 2a). The richest sites were some of the least disturbed and altered: the only sites with 40 or more species were grassland and scrub — inside the Bird Sanctuary at Hampstead Heath (site 14), at Barnes Common (sites 13 and 39), while the highest score for woodland was site 53 (Oxleas Wood). Another site inside the Bird Sanctuary at Hampstead Heath (site 79) gave the highest score for the wetland samples.

Other authors have noted that edge habitats can show a higher species richness than either woodland or grassland habitats (e.g. Hanggi and Baur 1998), as some species from each habitat survive at the edge of the other. Interestingly, samples in this study from the scrub sites showed the highest mean species richness (30.7 compared with 29.4 for all grassland sites and 25.2 for all woodland sites).

Phenology

Table 2b gives a summary of the seasonal variation in the catches, (using the 'census month' taken as the mid-point of each trapping period), while Table 4 lists the species in order of abundance with their occurrence by month.

In general numbers increase in the breeding season as mature males appear, but as the data indicate the various species exhibit very different phenological characteristics, implying very different breeding seasons. In summary the numbers vary from 1,015 (February) to 6,430 (May), with species richness of the monthly catches varying from 51 (31 per cent of the total) in February to 103 (62 per cent) in June (Table 4).

Most of the species trapped can be categorized as *stenochronous* (having a well-defined breeding season, typically in the summer but with a small group being clearly *winter-active*, i.e. winter-breeding), *eurychronous* (breeding more or less all year) or *opportunistic*. The last category includes some typical pioneer species. A few species appear to be to some extent *dichronous* (having two population peaks, and therefore probably two breeding seasons).

Stenochronous species include the main lycosids which all breed in early summer from April (*Trochosa* spp. and *Pardosa silvicultrix*) through May (*Alopecosa pulverulenta, Pardosa pullata, P. amentata, P. palustris* and *P. silvicultrix*). This last species, a woodland specialist, has a noticeable second peak in July, a characteristic that does not appear among the other lycosid species in this study. Other stenochronous species exhibiting strong summer maxima are *Milleriana inerrans* (male peak in April), *Xysticus cristatus* (May), *Diplocephalus picinus* (May), *Pocadicnemis juncea* (May) and *Phrurolithus festivus* (July).

The main stenochronous winter-active species are *Centomerita* spp., *Centromerus sylvaticus, C. dilutus* and *Helophora insignis.*

Most of the other common species are more or less eurychronous with males occurring throughout the year although nearly every species has a clearcut peak in numbers in a particular month (indicated by **bold type** in Table 4). Truly eurychronous species without a single peak are few in number, the main ones being the pioneers *Erigone dentipalpis, Oedothorax fuscus* and *O. retusus* which all exhibit several separate peaks. Nearly every month except February is the main breeding month for one or other of the eurychronous species. Mainly winter-breeding species include *Macrargus rufus* and *Walckenaeria acuminata,* while some of the most important summer-breeding eurychronous species are *Microneta viaria, Lepthyphantes tenuis* and *L. zimmermanni.*

A few species appear to be dichronous. *Bathyphantes gracilis* showed peaks in July/August and in the winter, November to January, while *Walckenaeria nudipalpis,* a much scarcer species, exhibits a similar pattern. *Erigone dentipalpis* could also be considered as dichronous.

Effects of disturbance

Among the grassland sites the effects of disturbance have been analysed in a preliminary way following the author's methods in previous papers (Milner 1993, 1994*a*). Disturbance is taken as physical damage to the site such as that caused by trampling and mowing, but not necessarily involving loss of material from the site.

Table 3a shows the same data as the grassland Tables 1 a–c with the data separated by estimated disturbance level rather than by habitat. Some further analysis of the data for grassland sites aggregated by disturbance level is given in Table 6. Even though this is a crude assessment the general trend of the results is interesting. As the disturbance level increases the spider numbers increase (the mean rising from 440 to 1,115) while the species richness decreases (from 32.8 to 25.0).

Table 5 gives figures for the occurrence and total numbers of the species most commonly found in the most-disturbed sites. As might be expected this list includes six of the seven pioneer species identified earlier although actual numbers are very varied.

Using the seven pioneer species (W) (*Oedothorax fuscus, O. retusus, Erigone dentipalpis, E. atra, Milleriana inerrans, Bathyphantes gracilis* and *Lepthyphantes tenuis*), and the grassland specialists (G) (taken as all lycosids) the relationship W/G gives what may be called a 'Site Conservation Value' (SCV) for the sites involved. Of course this can be calculated for individual sites as well (Milner 1993, 1994*a*, 1995). Sites with an SCV of 1 or above should be considered highly disturbed sites, with an unstable spider fauna, while sites with SCV scores below 1 are less disturbed and more stable. As the last column in Table 7 shows, the SCV of all the richest grassland sites sampled were well below 1.

Species autecology

When the distribution of species is examined, while there is still considerable variation between individual sites, the differences between the habitats becomes more marked (Table 3a–d). Among the species recorded a number of different ecological and phenological strategies are evident. Some species such as *Lepthyphantes tenuis* and *Bathyphantes gracilis* and to a lesser extent *Walckenaeria acuminata* and *Lepthyphantes ericaeus* are among the most frequently occurring and abundant species in all habitats and are clearly some of the best adapted species to these largely disturbed and eutrophic habitats in the London area. Some others, such as *Oedothorax fuscus, O. retusus, Erigone dentipalpis* and *E. atra*, exhibit a similar profile but are more or less absent from heavily shaded sites (i.e. most woodland sites), and the least disturbed sites of each habitat. It is hardly surprising that apart from *W. acuminata* and *L. ericaeus* these are four of the commonest and most abundant species recorded in disturbed habitats elsewhere (see Discussion below).

Apart from these ubiquitous disturbed-habitat specialists, the next commonest species in the main habitats show clear preferences but should still be seen as disturbed-habitat spiders but with a narrower ecological range. In disturbed grassland species such as *Pachygnatha degeeri, Pardosa palustris* and *Tiso vagans* are among the commonest species. Others such as *Pardosa pullata, Alopecosa pulverulenta, Dicymbium brevisetosum* and *Xysticus cristatus* are also clearly grassland specialists, although they may be more susceptible to disturbance, and they may also be found commonly in scrub which may be understood as a habitat intermediate between grassland and woodland.

In disturbed woodland *Lepthyphantes zimmermanni, L. flavipes, Macrargus rufus, Microneta viaria, Diplocephalus picinus* and *Monocephalus fuscipes* are characteristic. However, what superficially might appear to be the most charactersitic woodland species such as *Microneta viaria, Macrargus rufus,* and *Lepthyphantes flavipes* do not have such clear-cut preferences and are also found quite commonly in all the other habitats, just more so in woodland. *Pachygnatha clercki* is characteristic of both wetlands and damp grassy areas, while *Walckenaeria nudipalpis* and *Pardosa amentata* are two further common species which are more or less restricted to damp areas.

Although these differences can be seen clearly for some species, for others it is only when the assemblages of species found at the different sites are compared that ecological differences can be seen. Table 3 lists the main species trapped at sites in each habitat. From the grassland data (Table 3a) some differences are quite striking. Most of the characteristic grassland species occurred in much smaller numbers in the shaded grass sites, where a number of species thought to be more associated with woodland started to take over, for example *M. rufus, L. flavipes* and *M. viaria.* Among the grassland species some have a clear preference for shorter grass sites (*O. fuscus, E. dentipalpis, E. atra, M. inerrans*) while others prefer longer grass (e.g. *P. degeeri, P. pullata,* and *P. palustris*). *P. silvicultrix* did not occur in the short grassland, but was found in a few long grass sites and in nearly half of the shaded grass sites — as might be expected from a woodland species.

In fact these aggregate figures are in some ways misleading; the difference between the species profile for the richest sites and the poorest sites is marked at least for the two main habitat types, grassland and woodland (for which there are 35 and 28 samples respectively).

Table 8 gives parallel lists for these two habitats, and for scrub and wetland totals for just the three richest sites. The main differences in the lists are as follows with the main species placed in a series of groups:

Grassland sites. In group 1 (Table 8), *P. degeeri* scores highly in both the richest and the poorest sites, scores more highly in longer than shorter grass (Table 3a) and is among the most frequently occurring and abundant species at the most disturbed sites (Table 5). The other species in group 1 are lycosids which are grassland specialists, although from the data in these three tables it can be seen that they all have slightly different profiles. *P. palustris* stands out clearly as having some greater preference for more-disturbed and shorter grass than the others. *P. pullata* scores highest in the longer grass sites, and lower in the most disturbed and the poorest sites. The ideal habitat would seem to be longer grass with low disturbance, i.e. natural grassland. In fact at the site which comes closest to those conditions, site 13 at Barnes Common, *P. pullata* was the most abundant species. *A. pulverulenta* apparently has rather less preference for longer grass (Table 3a), but is more sensitive to disturbance and is very uncommon at the poorest sites while scoring almost as highly as *P. pullata* at the richest sites. *T. terricola* scores higher in long grass and shaded sites than in short grass, in richer rather than poorer sites, is not common in the most distubed sites and occurs frequently in scrub (Table 3c) where it is one of the commonest and most abundant species.

Group 2 are the seven pioneer species, abundant in the poorest sites where they average 529 per sample, and apart from the less common *M. inerrans* make up the overwhelming proportion of the total catch at the most disturbed sites. They also tend to score higher in shorter rather than longer grass, while *L. tenuis, O. fuscus* and *B. gracilis* are all among the commonest species in (these generally rather disturbed and degraded) wetland sites. These seven species are a clear indicator of a relatively impoverished spider assemblage.

Group 3 are species which whether characteristic of grassland or not tend to occur less frequently in the poorer sites. Included in this group are genuinely ubiquitous species like *W. acuminata* which, while never abundant are among the most frequently occurring species in all habitats except the shortest grass and the most disturbed sites where they are less common. Group 4 is two species which seem to occur in more or less similar frequencies in rich and poor sites: *C. bicolor* and *T. vagans.* The two species in Group 5 appear to be minor pioneers, preferring shorter grass and more-disturbed sites.

Group 6 are common in the richer sites but absent from the poorer ones. This suggests that these species do not compete as strongly and are among the commoner species displaced (under increased disturbance) by the pioneers. There are several other less-common grassland specialists. Indeed what seems to characterize the richer sites (even more than the profile of most frequent and abundant species) is the diversity of other species which never occur in large numbers (such as *T. pygmaeus* etc.).

Woodland sites. In woodland (at least among the woodland sites sampled) matters are less clearcut, although the most frequent species are quite different.

Interestingly only 13 species were found in 50 per cent or more of the woodland sites, while 19 species were found in 50 per cent or more grassland sites. Apart from *L. tenuis* none of the first ten species in the woodland list (Table 3b) is among the first ten in the grassland list. *D. picinus* and *M. rufus* are two of the commonest woodland species that are associated with the richest sites, while a number of others such as *L. zimmermanni, D. concolor* and *M. fuscipes* seem to be most characteristic of the poorer sites. *L. flavipes* and *M. viaria* vary less between the richer and the poorer sites, and the latter has been found elsewhere apparently to 'favour the edge zone over both the open grassland and the forest interior' (Hanggi and Baur 1998). Some woodland specialists such as *C. terrestris, L. pallidus* and *C. sylvaticus* do appear but not as either the most frequent or abundant species.

Scrubland sites. The scrub site data are even less easy to interpret, partly because there are fewer sites and partly because it is a less uniform category than the others. The spiders occurring in scrubland may also depend on the adjacent habitat: scrub next to woodland may have more woodland or shade-loving species than scrub which is an island within grassland.

Wetland sites. Among the wetland sites the data available are also difficult to interpret. Specialist species like *P. amentata* and *W. nudipalpis* and *Pirata* spp. are not as common as some of the ubiquitous species even in the best three sites, and although *P. clercki* occurs in almost every sample, in total numbers it trails well behind the pioneer *B. gracilis.* Other species that seem to favour wetland are *W. nudipalpis* and *P. amentata* although neither occurs in all three of the richest sites.

Discussion

'*Today many species have adapted to man-made environments . . . and those preferring open-ground conditions have greatly expanded their range. A gradation of life strategies from pioneer species to narrow specialists is proposed*' (Duffey 1993).

'*As a rule, the distribution of spiders does not depend on other animals but shows pronounced reactions to habitat structure and microclimate. Spiders, therefore, must be considered a very important potential indicator group*' (Hanggi, Stockli and Nentwig 1995). Limitations in the data aside, it is hoped that the results of these studies can make a small contribution to these ideas.

For ease of reference the conclusions are numbered.

1. From the results of this study it can be seen that disturbance is an important factor influencing the ground-living spider fauna. The seven common and abundant pioneer species appear to be specially adapted to disturbed habitats and include all the commonest species found by Alderweireldt (1993) to inhabit crop fields (i.e. a very disturbed habitat) in Belgium. His observations suggest that some of these spiders (unlike other linyphiids) do not use valuable energy spinning webs but hide in wait and attack their prey directly. The preponderance of these species even at many of the woodland sites studied suggests that disturbance may be the most important single factor affecting these spider faunas.

It is probably their strategies for surviving disturbance that have also contributed to *Lepthyphantes zimmermanni, Monocephalus fuscipes* and *Lepthyphantes flavipes* being among the commonest and most abundant species trapped in woodland in the London area. This is particularly the case in secondary woodland (such as most of the woodland sites except Oxleas Wood, Coldfall Wood, and to some extent Highgate Wood, which are ancient woodland sites with varying degrees of alteration).

Disturbance causes changes to all the habitats investigated and while numbers of pioneer species increase, other species decrease. High levels of disturbance clearly damage the conservation value of any site. What is not clear is how quickly any of the specialist species other than these pioneers are driven to local extinction.

2. Apart from disturbance, shade (even in grassland) and to a degree dampness of the habitat appear to be the next most influential characteristics affecting the spider fauna as a whole, and in particluar its abundance and species richness. It seems likely that this is strongly related to the availability of prey, and this is also probably the reason why the grassland habitats do support much greater numbers of ground-living spiders. Other authors such as Southwood and van Emden (1967) when comparing the invertebrate fauna (including spiders) of uncut and mown grassland found more animals on the mown than the unmown grassland although the biomass was slightly greater on the uncut. In this study, although there was considerable variability between sites when aggregated, the numbers (and biomass) were greater in the longer (i.e. uncut) grassland (Table 5). Certainly the biomass would be expected to be greater as the numbers of wolf spiders were low in the shortest grass samples, and as the author has reported previously (Milner 1994*a*) they increase and effectively replace the much smaller pioneer linyphiids such as *Oedothorax* spp. when mowing is reduced and the grass is allowed to grow taller.

3. Although the fauna at most sites was dominated by the disturbed-ground specialists, and other species with wide ecological requirements, quite a number of uncommon species which apparently have fairly narrow ecological requirements were also found. A number of regionally rare species were taken at Oxleas Wood, Barnes Common, Brompton Cemetery, the Vale of Health slopes and East Heath (Hampstead) and the 'heath' site at Alexandra Park. These appear to be all relic sites that have somehow retained their particular floristic character as oases in a mass of altered and 'improved' habitat. Brompton Cemetery was (unimproved) pastureland before becoming a cemetery, Oxleas Wood and Coldfall Wood are ancient woodland managed by coppicing for centuries and probably never clear-felled. The two Hampstead sites are perhaps the least altered and least mown or trampled parts of the entire Heath. The corner of Alexandra Park where the 'heath' site was located shows evidence of relic heath-grass flora (*Seiglingia decumbens* is recorded) and Barnes Common consists largely of unimproved neutral grassland.

All these relic sites show greater diversity than other more altered sites, and the additional species are mainly specialists with apparently rather narrow ecological requirements. Some of these spiders are regionally, even nationally, rare species: *Atypus affinis* (only 1 site in London) , *Tapinocyboides pygmaeus* (*Red Data Book* species), *Alopecosa cuneata* (only 2 sites in London), *Wiehlea calcarifera* (1 site in London), *Walckenaeria furcillata* (1 site in London).

In trying to assess the relative conservation value of the different sites, the occurrence of these species is a key factor. Indeed the comparison of sites using their simple species richness figure, can be improved by allocating relative value to species of different rarity (within London), as has been done with beetles and some other groups when assessing their valuable relic habitats. Elsewhere in this journal the author has allocated a conservation value for London (i.e. excluding Middlesex) to all the species known from the county. The scoring is as follows: 1 = species known from 10–14 sites in London, 2 = species known from 5–9 sites, 4 = species known from 2–4 sites, and 8 = species known from a single site. If these values are given, new figures for the relative quality, or what the author would like to call 'interestingness', of the different sites can be produced (see Table 7).

Among the sites that can now be taken to be more valuable for conservation are the Barnes Common, Oxleas Wood and Brompton Cemetery sites, while some of the Hampstead Heath sites such as site 14 (the highest species richness score) may have a diverse fauna, but a less 'interesting' one — i.e. one of relatively less conservation value.

4. The results suggest that ground-active spiders are sensitive indicators of the ecological health of the habitats sampled. In particular (a) SCV value or the proportion of the pioneer species in relation to the more specialist species — in grassland represented by the wolf spiders (Lycosidae), and (b) the 'interestingness' of each site, i.e. the numbers of the rarer species found, can be used. This approach works well for grassland but so far the best way of establishing an SCV for other habitats is not so evident. In woodland there is one specialist lycosid (*Pardosa silvicultrix*) but some other woodland species should probably be used. Which species would work best is not yet clear, but meanwhile any woodland sites where the pioneer species make up a significant proportion of the annual catch — say above 10 per cent — should be regarded as fairly disturbed and probably unstable assemblages.

5. The different phenological strategies of some British species have been noted by other authors such as Merrett (1969) and Milner (1987). The results of this study confirm and extend those findings. Interestingly, the phenological characteristics of the species recorded here (excluding those where the numbers trapped were insufficient to draw any firm conclusions) show a very wide spread: few species exhibited similar patterns, and indeed this analysis separates the species more effectively than habitat. This may mean that overall there is successive use of the food resource with the different species overlapping in the periods of their highest intake requirement. Several species are winter-active, presumably making use of the more limited but still considerable live food resource such as some beetles and their larvae, springtails, etc.

Of course one implication is that sites with low diversity (species richness) are most likely to have gaps, i.e. periods in the year when no species are sufficiently abundant to make the best use of the food resource and producing conditions which result in larger than normal fluctuations in prey populations. This may be seen as a feature of a relatively immature ecosystem.

Another implication is that to assess the spider fauna at a site, all-season sampling is essential to get a comprehensive idea of the ground-active fauna. Some winter-active species were found at every site, and the importance of the winter-active fauna should not be underestimated. Some of the pioneer species also show a secondary peak in activity in the winter and this presumably contributes to their success. The winter-activity of several species may be particularly relevant when considering the role of spiders in biological control — for example in relation to their predation of aphids whose populations may be particularly vulnerable in the winter.

6. Long-term monitoring of ground-active spiders may have other useful results, especially in terms of recording and assessing faunal changes due to modifications in management, and those influenced by wider changes to the whole environment such as that due to global warming etc.

The spider fauna of any area is constantly changing even without specific human interference affecting the habitat. Changes in land-use and pollution levels have probably had a major effect in the past, and from the existing records some changes in the fauna are known. Historically there have certainly been losses — *Diaea dorsata* was known from Hampstead Heath fifty years or so ago but is apparently no longer present, although it can still be found a few miles away at Ruislip Common in an area which the abundance of well-established anthills implies, has not been mown for many years if ever (unlike virtually all the grassland on Hampstead Heath). Mowing, trampling and the large quantities of nutrients deposited over time by dogs as well as the slow but constant deposition of other minerals from the atmosphere are all causing eutrophication of habitats throughout the London area. Professor Philip Grime (pers. comm.) has commented that most habitats in the Sheffield area are showing floristic evidence of degradation due to eutrophication, and he surmises that this effect is more or less universal in the UK.

The likely results may happen slowly but should be detectable over periods of decades rather than centuries. Most likely are the reduction in the species richness of some sites, eventual losses of specialists, and increases in the predominance of the pioneer species. Warming of the climate could be expected to affect the spider fauna in both direct and indirect ways. There may be increases in the insect biomass, and this could have a positive effect on the spider fauna. Also there may be more larger prey insects and this may encourage some of the larger spiders. Northern spider species may be expected to decline (such as *Walckenaeria* spp.), while southern species (such as *Zodarion* ssp., recent arrivals from Europe) can be expected to increase in numbers and abundance. In fact *Z. italicum* is not yet common enough for any assessment to be made as to which species it may displace, but in time this may become evident. Intriguingly, the pan-tropical *Coleosoma blanda* was trapped in a pitfall at one of the sites included in these studies but outside the trapping period (Milner 1994*b*). This record (the first for Britain) appears to be an anomaly, but could be evidence of global warming, although a single specimen is not sufficient to draw any firm conclusion. However, other invaders should be expected to arrive and to displace some of our indigenous species, while other even common species are likely to decline or increase as climatic changes occur.

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TABLE 1. List of 12-month pitfall samples grouped by habitat (**a–g**) with numbers of spiders trapped and species count. All sites are in the county of London, except those marked (M) for Middlesex.

Ref. = reference number of trap site
Place = author's name for trapping site
Dist. = level of disturbance
Start = date of start of 12-month sampling period
Nos. = total number of spiders trapped
Spp. = number of species (species richness)
* = sites showing evidence of eutrophication

Ref.		**Locality**	**Place**	**Dist.**	**Start**	**Nos.**	**Spp.**
a. Habitat: grass: short (<10 cm)							
1	1	*Brompton Cemetery	oak	medium	1.xii.1994	458	35
2	2	*Brompton Cemetery	yew	medium	1.xii.1994	464	31
3	3	Hampstead Heath (sector 3)	05	medium	10.v.1991	951	24
4	4	*Hampstead Heath (sector 5)	511	medium	2.x.1994	561	31
5	6	*Alexandra Park (M)	oak	high	30.ix.1985	1,563	33
6	7	Hampstead Heath (sector 1)	10	high	10.v.1991	995	29
7	9	Hyde Park	birch	high	1.xii.1994	776	16
8	10	Hyde Park	descha	high	1.xii.1994	1,418	17
9	11	80 Weston Park (M)	lawn	high	15.ix.1986	843	19
b. Habitat: grass: long (>10 cm)							
10	12	Alexandra Park (M)	tussoc	low	16.vi.1985	237	31
11	13	*Barnes Common	open	low	6.ii.1990	464	42
12	14	*Hampstead Heath (sector 2)	03	low	10.v.1991	549	45
13	15	Hampstead Heath (sector 3)	314	low	6.vi.1995	807	25
14	16	*West Heath, Hampstead (M)	012	medium	8.v.1993	265	24
15	17	*Kensington Gardens (Hyde Pk)	grass	low	1.xii.1994	222	25
16	18	*Alexandra Park (M)	heath	medium	16.vi.1985	1,143	34
17	19	Coldfall Wood (M)	glade	medium	1.i.1991	570	38
18	20	Hampstead Heath (sector 1)	112	medium	10.i.1995	1,549	28
19	21	Hampstead Heath (sector 3)	311A	medium	10.i.1995	625	28
20	22	Hampstead Heath (sector 5)	512	medium	2.x.1994	472	30
21	23	Hampstead Heath (sector 6)	08	medium	10.v.1991	727	28
22	24	Hampstead Heath (sector 6)	611	medium	1.ii.1995	1,198	26
23	25	Mutton Brook, Gold.Green(M)	mut	medium	22.v.1990	331	30
24	26	*Putney Heath	birch	medium	2.xii.1990	169	26
25	27	Hampstead Heath (sector 1)	111A	high	10.i.1995	1,562	32
c. Habitat: grass: shaded							
26	28	Barnes Common	gorse	low	6.ii.1990	501	36
27	29	West Heath, Hampstead (M)	013	low	8.v.1993	258	32
28	30	Queen's Wood (M)	grass	low	6.v.1989	484	26
29	31	Hampstead Heath (sector 5)	543	medium	2.x.1994	350	35
30	32	West Heath, Hampstead (M)	712	medium	1.iii.1995	384	35
31	34	Highgate Woods (M)	HW01	medium	5.xii.1994	437	28
32	35	Highgate Woods (M)	HW05	medium	5.xii.1994	299	27
33	36	Highgate Woods (M)	HW06	medium	5.xii.1994	140	26
34	37	Highgate Woods (M)	HW07	medium	5.xii.1994	222	34
35	38	Queen's Wood (M)	north	high	1.i.1989	646	29
d. Habitat: scrub/dense vegetation							
36	39	Barnes Common	leaves	low	6.ii.1990	456	40
37	40	Coldfall Wood (M)	logs	low	15.ii.1993	193	23
38	41	Hampstead Heath (sector 5)	534	low	28.x.1994	294	37
39	42	Putney Heath	heathe	low	2.xii.1990	157	34
40	43	Hampstead Heath (sector 2)	231	medium	4.i.1995	86	23

Ref.		Locality	Place	Dist.	Start	Nos.	Spp.
41	44	Hampstead Heath (sector 5)	532	medium	2.x.1994	166	29
42	45	Hampstead Heath (sector 5)	533	medium	28.x.1994	176	31
43	46	Hampstead Heath (sector 5)	535	medium	2.x.1994	218	29
44	47	Sandy Heath, Hampstead (M)	831	medium	2.x.1994	114	31
45	48	West Heath, Hampstead (M)	731	high	2.x.1994	159	26
e. Habitat: woodland (veg.)							
46	49	Hampstead Heath (sector 6)	09	low	10.iv.1991	189	30
47	50	Hampstead Heath (sector 6)	621	low	28.x.1994	138	16
48	51	Highgate Woods (M)	HW04	low	5.xii.1994	201	21
49	52	Hyde Park	ivy	low	1.xii.1994	199	19
50	53	Oxleas Wood	coppic	low	20.iv.1987	339	33
51	54	Oxleas Wood	lids	low	20.iv.1987	191	21
52	55	Queen's Wood (M)	brambl	low	1.i.1989	276	22
53	56	Alexandra Park (M)	wood	medium	16.vi.1985	90	23
54	57	Coldfall Wood (M)	newco	medium	1.i.1991	232	23
55	58	Highgate Woods (M)	HW02	medium	5.xii.1994	147	18
56	59	Highgate Woods (M)	HW03	medium	5.xii.1994	197	17
f. Habitat: woodland (litter)							
57	60	Alexandra Park (M)	newwoo	low	6.iv.1986	144	23
58	61	Hampstead Heath (sector 3)	321	low	28.x.1994	139	19
59	62	Hampstead Heath (sector 5)	524	low	6.iii.1995	121	18
60	63	Oxleas Wood	oak	low	20.iv.1987	205	24
61	64	Oxleas Wood	old oak	low	20.iv.1987	216	29
62	65	Queen's Wood (M)	cleari	low	1.i.1989	261	28
63	66	Queen's Wood (M)	tree	low	1.i.1989	228	18
64	67	Coldfall Wood (M)	densc	medium	1.i.1991	205	16
65	68	Hampstead Heath (sector 5)	521	medium	2.x.1994	144	17
66	69	Hampstead Heath (sector 5)	522	medium	2.x.1994	192	16
67	70	Sandy Heath, Hampstead (M)	821	medium	25.xi.1994	218	18
68	71	West Heath, Hampstead (M)	721	medium	26.xi.1994	84	10
69	72	Kensington Gardens (Hyde Pk)	wood	medium	1.xii.1994	124	18
70	73	Hyde Park	soil	medium	1.xii.1994	268	16
71	74	Oxleas Wood	path	medium	20.iv.1987	175	27
72	75	Hampstead Heath (sector 1)	121	high	28.x.1994	520	30
73	76	Queen's Wood (M)	grids	high	1.i.1989	407	17
g. Habitat: wetland/bog							
74	77	Coldfall Wood (M)	rushes	low	15.ii.1993	209	19
75	78	Hampstead Heath (sector 3)	371	low	28.xi.1994	177	23
76	79	Hampstead Heath (sector 2)	04	medium	10.v.1991	466	39
77	80	Hampstead Heath (sector 5)	572	medium	25.xi.1994	170	17
78	81	Oxleas Wood	pond	medium	20.iv.1987	231	29
79	82	Hampstead Heath (sector 2)	02	high	10.v.1991	313	26
80	83	Hampstead Heath (sector 6)	11	high	10.v.1991	505	32
81	84	Hampstead Heath (sector 6)	612	high	1.ii.1995	210	17
82	85	Hampstead Heath (sector 2)	07	high	10.v.1991	427	27

TABLE 2. Summary of catches: **a** by habitat type, **b** by month.

N = number of samples
Nos. = total of spiders
Spp. = no. of species

a — Summary by habitat type

Habitat type	**N**	**Nos.**	**Mean**	**Spp.**	**Mean**
Grass: short	9	8,029	892	78	26.2
: long	16	10,890	681	101	30.8
: shaded	10	3,721	372	83	30.1
all grassland	**35**	**22,640**	**647**	**129**	**29.4**
Scrub	**10**	**2,019**	**202**	**54**	**30.7**
Woodland: veg.	11	2,199	200	77	22.0
: litter	17	3,651	215	85	20.2
all woodland	**28**	**5,850**	**209**	**106**	**21.5**
Wetland	**9**	**2,708**	**301**	**75**	**25.2**
Total	**82**	**33,217**	**405**	**167**	**25.9**

b — Summary by month

Using 'census month', i.e. the mid-point of each trapping period.

Month	**Species**	**Numbers**	**Month**	**Species**	**Numbers**
Jan	54	1,645	Jul	96	3,899
Feb	51	1,015	Aug	101	2,923
Mar	67	1,803	Sep	77	1,345
Apr	91	5,406	Oct	76	1,675
May	102	6,430	Nov	61	1,248
Jun	103	4,099	Dec	57	1,729

TABLE 3. The main species trapped in each habitat type. Each list gives species found in 10 or more of sites.

a — All grassland sites (n=35)

O = occurrence (i.e. number of samples in which the species was found)
T = total number of individuals trapped

Spider	**Totals** n = 35		**Short** n = 10		**Long** n = 16		**Shaded** n = 9	
	O	T	O	T	O	T	O	T
Lepthyphantes tenuis	35	875	10	309	16	335	9	231
Pachygnatha degeeri	34	4,036	10	1,228	16	2,643	8	165
Pardosa pullata	31	1,416	9	231	16	882	6	303
Bathyphantes gracilis	31	840	9	382	16	349	6	109
Centromerita bicolor	27	349	9	147	14	187	4	15
Tiso vagans	26	1,029	7	330	13	563	6	136
Lepthyphantes ericaeus	26	203	4	12	13	127	9	64
Micrargus herbigradus	25	230	5	22	11	149	9	59
Alopecosa pulverulenta	24	943	6	342	13	508	5	93
Trochosa terricola	24	374	5	74	12	161	7	139
Walckenaeria acuminata	24	136	3	6	11	29	10	101
Lepthyphantes flavipes	23	315	5	13	8	38	10	264
Erigone dentipalpis	22	1,680	10	1,424	10	179	2	77
Dicymbium brevisetosum	22	398	7	167	13	228	2	3
Microneta viaria	22	239	1	3	11	63	10	173
Erigone atra	19	582	9	475	7	82	3	25

Spider	**Totals**		**Short**		**Long**		**Shaded**	
	n = 35		n = 10		n = 16		n = 9	
	O	T	O	T	O	T	O	T
Gongylidiellum vivum	19	88	4	23	11	41	4	24
Pachygnatha clercki	18	464	4	15	12	428	2	21
Diplostyla concolor	18	232	3	13	8	147	7	72
Oedothorax fuscus	17	2,918	7	2,196	9	719	1	3
Xysticus cristatus	17	220	5	73	11	146	1	1
Pardosa palustris	16	1,298	7	262	9	1,036	0	0
Macrargus rufus	16	367	1	2	5	62	10	303
Stemonyphantes lineatus	16	78	4	31	7	37	5	10
Lepthyphantes zimmermanni	16	67	1	2	6	14	9	51
Monocephalus fuscipes	15	129	2	3	5	40	8	86
Diplocephalus picinus	14	210	2	2	3	9	9	199
Centromerita concinna	14	162	3	36	5	119	6	7
Pocadicnemis juncea	14	80	4	5	7	58	3	17
Enoplognatha thoracica	14	66	5	21	6	37	3	8
Linyphia clathrata	13	55	0	0	6	34	7	21
Walckenaeria antica	13	44	3	7	8	34	2	3
Oedothorax retusus	12	377	6	142	5	234	1	1
Pardosa amentata	12	138	3	9	6	76	3	53
Robertus lividus	11	77	1	1	3	15	7	61
Meioncta rurestris	11	38	5	20	5	17	1	1
Lepthyphantes pallidus	11	23	4	5	6	17	1	1
Diplocephalus latifrons	10	286	0	0	4	12	6	274
Enophrys frontalis	10	36	3	16	5	15	2	5
Centromerus dilutus	10	19	1	1	2	3	7	15

b — All woodland sites

Species found in 8 or more sites.

	Totals		**Wood. veg**		**Wood. litter**	
	n = 28		n = 11		n = 17	
	O	T	O	T	O	T
Microneta viaria	28	846	11	385	17	461
Lepthyphantes zimmermanni	27	847	10	344	17	503
Lepthyphantes flavipes	26	504	10	122	16	382
Diplocephalus picinus	25	874	9	248	16	626
Monocephalus fuscipes	24	342	8	70	16	272
Walckenaeria acuminata	22	224	9	72	13	152
Diplostyla concolor	22	189	9	89	13	100
Lepthyphantes tenuis	21	110	8	51	13	59
Macrargus rufus	19	379	8	231	11	148
Clubiona terrestris	19	58	9	37	10	21
Lepthyphantes ericaeus	17	87	7	56	10	31
Lepthyphantes pallidus	16	52	4	17	12	35
Centromerus sylvaticus	14	95	7	63	7	32
Maso sundevalli	14	64	5	9	9	55
Saaristoa abnormis	14	46	6	28	8	18
Helophora insignis	14	44	5	11	9	33
Centromerus dilutus	14	37	6	18	8	19
Bathyphantes gracilis	13	42	5	9	8	33
Diplocephalus latifrons	12	215	3	9	9	206
Micrargus herbigradus	11	52	4	8	7	44
Coelotes terrestris	8	63	4	28	4	35
Gongylidium rufipes	8	29	4	11	4	18
Linyphia clathrata	8	19	6	16	2	3

c — All scrub sites (n = 10)

	O	T		O	T
Pardosa pullata	10	200	*Pocadicnemis juncea*	7	45
Lepthyphantes tenuis	10	99	*Lepthyphantes zimmermanni*	7	41
Walckenaeria acuminata	10	65	*Micrargus herbigradus*	7	27
Lepthyphantes ericaeus	9	71	*Diplocephalus picinus*	7	19
Lepthyphantes flavipes	9	64	*Alopecosa pulverulenta*	6	81
Microneta viaria	8	137	*Robertus lividus*	6	36
Trochosa terricola	8	123	*Pachygnatha degeeri*	6	34
Linyphia clathrata	8	15	*Walckenaeria cucullata*	6	32
Monocephalus fuscipes	7	145	*Gongylidiellum vivum*	6	13
Macrargus rufus	7	63	*Ero furcata*	6	11
Bathyphantes gracilis	7	47			

d — All wetland sites (n = 9)

	O	T		O	T
Bathyphantes gracilis	8	369	*Lepthyphantes ericaeus*	6	24
Pachygnatha clercki	8	166	*Oedothorax fuscus*	5	138
Lepthyphantes tenuis	7	117	*Pardosa amentata*	5	116
Walckenaeria acuminata	6	33	*Macrargus rufus*	5	28
Walckenaeria nudipalpis	6	25			

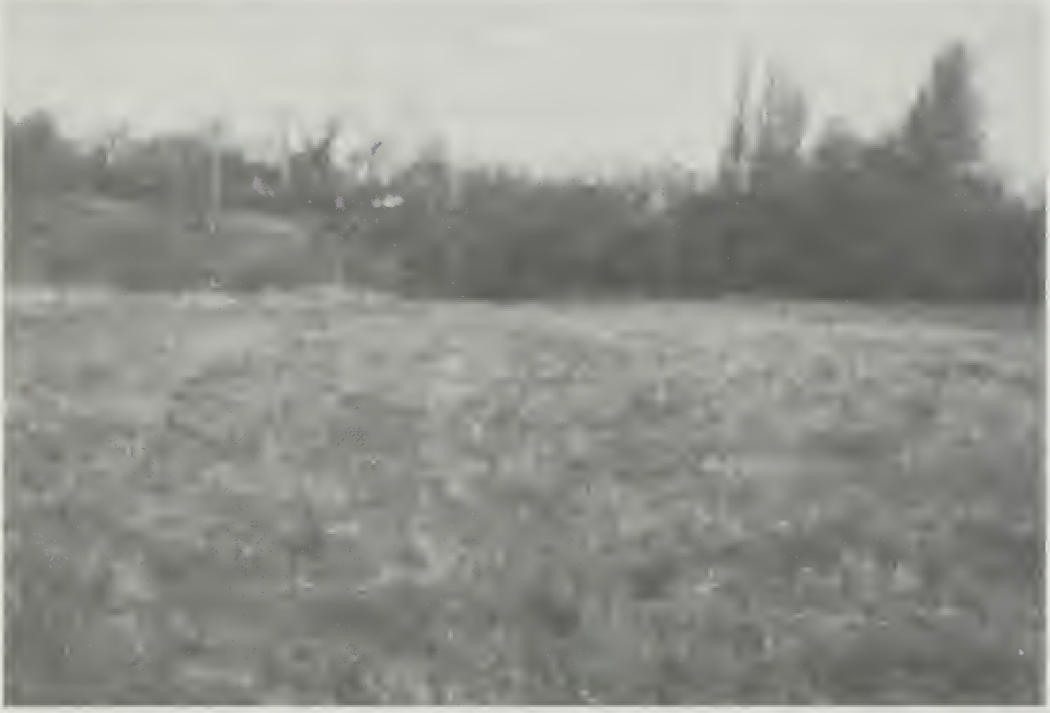

FIGURE 1. Hampstead Heath: Upper Cohen's Field. Long grass with low disturbance.

TABLE 4. Phenology: monthly analysis in detail. Peak figures in **bold**.

PS = phenological strategy: ES = eurychronous (summer max.); EW = eurychronous (winter max.) 'winter-active'; D = dichronous; SS = stenochronous (summer max.); SW = stenochronous (winter max.); E = early season; L = late season.

	Species	PS	J	F	M	A	M	J	J	A	S	O	N	D	Total
1	*P. degeeri*	ES	108	121	341	**1,335**	1,034	409	121	198	83	120	97	130	4,097
2	*Oe. fuscus*	ES	36	55	78	250	247	213	**605**	446	415	**518**	123	**206**	3,192
3	*E. dentipalpis*	D	**226**	85	196	177	201	187	217	**296**	41	41	16	85	1,768
4	*P. pullata*	SS		1	8	278	**558**	434	283	102	11	2		1	1,678
5	*P. palustris*	SS			17	83	**491**	361	208	129	9	6			1,304
6	*B. gracilis*	D	101	31	43	45	31	112	201	**325**	26	28	112	**243**	1,298
7	*D. picinus*	SS	1			44	**803**	353	74	7			1		1,283
8	*M. viaria*	SS	18	11	128	**609**	260	66	53	26	17	19	20	17	1,244
9	*L. tenuis*	ES	54	36	54	51	72	177	**269**	138	72	114	86	78	1,201
10	*T. vagans*	ES	20	15	77	**288**	273	111	83	17	15	81	47	38	1,065
11	*A. pulverulenta*	SS		2	19	179	**607**	133	55	39	4	3			1,041
12	*L. zimmermanni*	ES	25	18	18	45	85	134	**221**	150	96	126	42	24	984
13	*L. flavipes*	ES	34	45	42	97	107	125	98	99	56	76	61	58	898
14	*M. rufus*	EW/SW	**417**	209	50	34	18	13	4	1	8	22	21	40	837
15	*P. clercki*	ES	42	41	89	**256**	68	35	17	52	20	18	8	12	658
16	*E. atra*	E	57	36	74	**94**	26	51	**149**	118	10	14	8	6	643
17	*M. fuscipes*	SSE	10	24	161	**279**	72	26	9	6	4	6	8	15	620
18	*D. concolor*	ES	17	17	14	52	62	80	**134**	86	34	41	22	20	579
19	*D. latifrons*	ES	6	54	68	134	**159**	75	21	27	4	7	4	11	570
20	*T. terricola*	SSE	1	15	60	**224**	72	12	31	54	35	4		1	509
21	*W. acuminata*	EW	**99**	33	20	42	57	39	39	4	6	25	17	77	458
22	*Oe. retusus*	SS	1	1	2	58	126	18	**128**	21	27	44	6	2	434
23	*D. brevisetosum*	EW	8	2	11	25	27	26	19	4	15	108	**126**	58	429
24	*C. bicolor*	SW	**102**	17	6	4	1					11	42	236	419
25	*P. silvicultrix*	SS				**121**	84	39	**95**	42	6				387
26	*L. ericaeus*	E	31	13	6	19	21	37	51	52	26	27	**67**	35	385
27	*M. herbigradus*	ES	9	3	16	44	42	**81**	76	23	4	14	8	10	330
28	*P. amentata*	SS				42	**138**	46	33	15	1				275
29	*X. cristatus*	SS			4	44	**125**	37	9	6	1	2			228
30	*M. inerrans*	SS		6	24	**46**	31	28	27	38	6	7	2	2	217

	Species	PS	J	F	M	A	M	J	J	A	S	O	N	D	Total
31	*C. sylvaticus*	SW	53	14	3	2	3					4	18	**94**	191
32	*C. concinna*	SW	38	13	10	1	1					1	31	**76**	171
33	*T. ruricola*	SSE			29	**81**	15	5		13	6	1			150
34	*P. juncea*	SS			2	1	**55**	45	23	8				1	135
35	*G. vivum*	ES	7	1	2	10	**28**	26	10	2	2	12	14	16	130
36	*R. lividus*	EW	4	5	6	9	17	29	**32**	8		2	8	10	130
37	*A. proxima*	SW	3	1	3						30	2	**72**	11	122
38	*A. decora*	SS				19	5	9	**41**	20	1	27			122
39	*S. lineatus*	ES	22	30	27	11	6	4	1	1		1	**7**	10	120
40	*A. elegans*	E	1	2	2	11	17	6	3	11	24	11	**27**		115
41	*L. pallidus*	EW	12	3	2	6	4	11	14	9	3	13	**28**	8	113
42	*L. robustum*	E	6	2	4	12	9	6	20	13	9	**20**	4	2	107
43	*L. clathrata*	SS	1	5	9	15	15	**17**	11	2	6	14	6	5	106
44	*Cl. terrestris*	SSL	3	1		2	2	8	9	**44**	21	12	3		105
45	*M. sundevalli*	SS	2		1		5	**80**	11	4	1			1	105
46	*P. prativaga*	SS			9	1	13	3	18	**53**					97
47	*P. festivus*	SS				1	10	27	**33**	15	2				88
48	*H. montana*	SSL						1		7	**48**	1	28		85
49	*A. cuneata*	SS				**53**	20	5		2					80
50	*S. abnormis*	SS					5	28	**29**	7		1		2	72
51	*E. thoracica*	SS				2	**46**	15	5	3					71
52	*C. dilutus*	SW	**11**	10	4	3	33	1	1	1			6	**29**	69
53	*Coe. terrestris*	SSL			1	2	2	1	2	2	**50**	4	1		65
54	*H. nava*	SS				3	18	**35**	3	3	1				63
55	*W. antica*	ESE	2	3	2	**14**	10	4	7	9	1	2	6	3	63
56	*M. subaequalis*	SSL						17	**39**	4	1	1			62
57	*W. cucullata*	SS			6	18	**25**	2	5	2	1				59
58	*D. lapidosus*	SS				1	1	**21**	20	10	3		1		57
59	*P. gibbum*	ES	4	2	7	7	**14**	10		1		1	2	8	56
60	*B. parvulus*	SS					1	**27**	14	6	2	2			52
61	*Oe. gibbosus*	SS				1	11	6	**28**	4		1			51
62	*D. permixtus*	EW	**12**	5	10	3	7	5		2	1	1	2	2	50
63	*G. rufipes*	SS				9	**17**	12	8	1	1				48
64	*H. insignis*	SW	**13**	11	5					1		6	3	8	47
65	*W. atrotibialis*	SS						15	**31**	1					47
66	*M. rurestris*	SS				6	7	6	11	**14**	2	1			47

	Species	**PS**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Total**
67	*E. frontalis*	SS				4	3	**17**	7	11	3				45
68	*Z. latreillei*	SS				6	**10**	3	5	**10**	7	1	3		45
69	*Z. italicum*	SS			1	9	2	**14**	1	**10**	3	4			44
70	*W. nudipalpis*	D	7	3	4	4	1	4	7	3		2	2	2	39
71	*E. furcata*	D	1		2	7	4	3	3	3	3	3	4		33
72	*L. mengei*	ES	5			2	2	2	2	**16**		1		3	33
73	*T. bimaculatum*	SS				1	7	**16**	5	1					30
74	*L. minutus*	EW	2				1			5	1	7	6	7	29
75	*M. beata*	SS			1	7	6	1	**11**	2			1		29
76	*P. sulcifrons*	SS				7	**18**	3					1		29
77	*M. saxatilis*	SS					3	10	**13**		1				27
78	*C. compta*	SS		1		6	6	2	7	1	1	1	1		26
79	*H. bituberculatum*	SS				1	**13**	6	3	1					24
80	*T. agrestis*	SS								6	**15**	1	1	1	24
81	*L. tenebricola*	SS					2	**16**	3	2					23
82	*G. dentatum*	SS			1	1	4	4	**8**			1		2	21
83	*C. atropos*	SS							3	**12**	4				19
84	*B. approximatus*	SS			1	1		2	**13**		1				18
85	*Z. spinimana*	SS	1				9	3	1	2	1			1	18
86	*P. mirabilis*	SS	1		1	5	5	3	2						17
87	*E. hiemalis*	SS				7	3	3	3						16
88	*T. longidens*	SW	1							1	**11**	1	1	1	16
89	*H. helveola*	SW	2	1	3							1		8	15
90	*T. praecox*		1	3	1	1		2					2	5	15
91	*F. bucculenta*	SW									4	**10**			14
92	*L. punctatum*		1	1	1	5	1		2		3				14
93	*P. piraticus*						3	7	3						13
94	*P. parallela*			1	5	2	1		1	3					13
95	*S. frontata*		2		3	2			1	2		1		1	12
96	*A. humilis*		1		1						1	3	3	2	11
97	*Z. apricorum*						3	1	4	3					11
98	*L. triangularis*					1				3	2	2	2		10
99	*S. cornigera*					7						1			8
100	*C. obscurus*						3	1	2	2					8
101	*C. reclusa*					1	2	3	2						8
102	*N. cellulanus*			1				2	2	1	1				7

	Species	PS	J	F	M	A	M	J	J	A	S	O	N	D	Total
103	*D. cristatus*		2					2		1		1		1	7
104	*E. oelandica*						4	2							6
105	*L. cristatus*							2	4						6
106	*M. pulicaria*							1	3	2					6
107	*P. microphthalmum*			1	1	1		1		1			1		6
108	*Oe. agrestis*					1	1		4						6
109	*M. mengei*					1		1			1	2		1	6
110	*P. pumila*							1	4						5
111	*T. pygmaeus*				1	3	1								5
112	*L. insignis*				1						1		3		5
113	*L. hortensis*					2	1	2							5
114	*H. hombergi*						1				4				5
115	*C. lutescens*						1		1	2					4
116	*E. cambridgei*			1	1			1					1		4
117	*P. hygrophilus*						4								4
118	*M. segmentata*					1		1				1	1		4
119	*C. diversa*					1				1		1			3
120	*T. gigantea*										2	1			3
121	*A. ferox*	SS					3								3
122	*A. labyrinthica*						1	1		1					3
123	*C. corticalis*							2	1						3
124	*L. thoracica*									1	1	1			3
125	*P. pygmaeum*						1					1		1	3
126	*L. humilis*					2	1								3
127	*W. furcillata*							2	1						3
128	*A. similis*				1				1		1				3
129	*R. ovata*								2	1					3
130	*D. crocata*					1				1	1				3
131	*P. cespitum*							1	1		1				3
132	*T. silvestris*										2				2
133	*W. calcarifera*				2										2
134	*A. affinis*												2		2
135	*E. aequipes*							1		1					2
136	*H. pygmaea*					1								1	2
137	*C. stagnatilis*						2								2
138	*H. flavipes*					1									1

Species	PS	J	F	M	A	M	J	J	A	S	O	N	D	Total
139 *T. mystaceum*							1							1
140 *P. dispar*									1					1
141 *O. praticola*							1							1
142 *X. kochi*									1					1
143 *T. tinctum*						1								1
144 *M. virescens*								1						1
145 *T. pallens*							1							1
146 *A. diadematus*											1			1
147 *C. brevipes*						1								1
148 *W. unicornis*						1								1
149 *D. bifrons*								1						1
150 *C. neglects*									1					1
151 *C. phragmitis*									1					1
152 *C. cicur*											1			1
153 *T. scabriculus*						1								1
154 *P. campbelli*						1								1
155 *A. conigera*								1						1
156 *C. incilium*		1												1
157 *D. cupreus*									1					1
158 *S. senoculata*						1								1
159 *T. experta*													1	1
160 *D. socialis*										1				1
161 *L. obscurus*								1						1
162 *L. montana*						1								1
163 *P. cambridgei*				1										1
164 *O. pulcher*									1					1
165 *A. vittatus*							1							1
166 *A. fenestralis*			1											1
167 *T. domestica*									1					1
168 sp. indet.			2		1		1					2		6
	Species	54	51	67	91	102	103	96	101	77	76	61	57	
	Nos.	1,645	1,015	1,803	5,406	6,430	4,099	3,899	2,923	1,345	1,675	1,248	1,729	33,217

TABLE 5. The commonest and most abundant species at the most disturbed sites (7 grass sites, 2 woodland, 1 scrub and 4 wetland = total 14 sites).

Species	**Occurrence**	**Numbers**	**Species**	**Occurrence**	**Numbers**
B. gracilis	14	631	*C. bicolor*	10	179
L. tenuis	14	407	*P. pullata*	10	150
O. fuscus	12	2,123	*D. brevisetosum*	10	140
P. degeeri	12	1,736	*O. retusus*	10	124
E. dentipalpis	11	1,532	*T. vagans*	9	448
E. atra	11	520			

TABLE 6. Grassland data aggregated by disturbance level.

a Summary
b Selected species: average numbers per sample, aggregated by disturbance level
c Details of sites

a — Summary

m(n) = mean numbers per sample
m(s) = mean number of species per site
D = disturbance level
W = pioneer species
n = number of sites
G = grassland species

D	**n**	**Total nos.**	**m(n)**	**Total species**	**m(s)**	**W**	**G**	**SCV (W/G)**
Low	8	3,522	440.3	110	32.8	538	1,490	0.36
Medium	20	11,315	565.8	136	29.9	3,636	4,342	0.84
High	7	7,803	1,114.7	79	25.0	6,221	427	14.57
All grass	35	22,640	646.86		29.57			

b — Selected species

Average numbers per sample, aggregated by disturbance level.

U = ubiquitous species; GS = grassland specialists; GS/D = disturbed-grassland species

Type	**Species**	**Disturbance**		
		low	**medium**	**high**
GS	*Pardosa pullata*	87	47	16
GS	*Alopecosa pulverulenta*	39	45	9
GS/D	*Pardosa palustris*	30	65	35
W	*Pachygnatha degeeri*	13	168	258
W	*Oedothorax fuscus*	9	88	298
W	*Erigone dentipalpis*	6	17	277
W	*Milleriana inerrans*	0.25	2	50
W	*Bathyphantes gracilis*	5	23	86
U	*Lepthyphantes tenuis*	30	27	86

c — Details of sites

Ref. = reference number of trap site
Place = author's name for trapping site
Dist. = level of disturbance
Start = date of start of 12-month sampling period
Nos. = total number of spiders trapped
Spp. = number of species (species richness)

Ref.	**Locality**	**Place**	**Nos.**	**Spp.**
Disturbance level: low				
1 12	Alexandra Park	tussoc	237	31
2 13	Barnes Common	open	464	42
3 14	Hampstead Heath	03	549	45
4 15	Hampstead Heath	314	807	25
5 17	Kensington Gardens	grass	222	25
6 28	Barnes Common	gorse	501	36
7 29	West Heath, Hampstead	013	258	32
8 30	Queen's Wood	grass	484	26
Disturbance level: medium				
9 1	Brompton Cemetery	oak	458	35
10 2	Brompton Cemetery	yew	464	31
11 3	Hampstead Heath	05	951	24
12 4	Hampstead Heath	511	561	31
13 16	West Heath, Hampstead	012	265	24
14 18	Alexandra Park	heath	1,143	34
15 19	Coldfall Wood	glade	570	38
16 20	Hampstead Heath	112	1,549	28
17 21	Hampstead Heath	311A	625	28
18 22	Hampstead Heath	512	472	30
19 23	Hampstead Heath	08	727	28
20 24	Hampstead Heath	611	1,198	26
21 25	Mutton Brook	mut	331	30
22 26	Putney Heath	birch	169	26
23 31	Hampstead Heath	543	350	35
24 32	West Heath	712	384	35
25 34	Highgate Woods	HW01	437	28
26 35	Highgate Woods	HW05	299	27
27 36	Highgate Woods	HW06	140	26
28 37	Highgate Woods	HW07	222	34
Disturbance level: high				
29 6	Alexandra Park	oak	1,563	33
30 7	Hampstead Heath	10	995	29
31 9	Hyde Park	birch	776	16
32 10	Hyde Park	descha	1,418	17
33 11	80 Weston Park	lawn	843	19
34 27	Hampstead Heath	111A	1,562	32
35 38	Queen's Wood	north	646	29

TABLE 7. The 'best' (London county) sites in all habitats estimated by species richness and 'interestingness'.

Ref. = reference number of trap site
Hab. = habitat
Place = author's name of trapping site
Dist. = level of disturbance
Nos. = total number of spiders trapped
Spp. = number of species (species richness)
I = 'interestingness' (weighted conservation value), based on scores as follows (from Milner 1999):
1 = 10–14 London sites: of some local conservation value
2 = 5–9 London sites: important local species
4 = 2–4 London sites: locally rare or threatened
8 = 1 London site only : highest conservation status
SCV = (grassland sites only) for explanation see Table 6.

Ref.	**Locality**	**Hab.**	**Place**	**Dist.**	**Nos.**	**Spp.**	**I**	**SCV**
13	Barnes Common	Gl	open	Low	464	42	51	0.04
53	Oxleas Wood	Wv	coppic	Low	339	33	47	
2	Brompton Cemetery	Gs	yew	Medium	464	31	45	0.07
74	Oxleas Wood	Wl	path	Medium	175	27	45	
63	Oxleas Wood	Wl	oak	Low	205	24	43	
78	Hampstead Heath (sect.3)	Wt	371	Low	177	23	39	
1	Brompton Cemetery	Gs	oak	Medium	458	35	38	0.12
39	Barnes Common	Scr	leaves	Low	456	40	37	
81	Oxleas Wood	Wt	pond	Medium	231	29	37	
41	Hampstead Heath (sect.5)	Scr	534	Low	294	37	36	
4	Hampstead Heath (sect.5)	Gs	511	Medium	561	31	36	0.29
28	Barnes Common	Gsh	gorse	Low	501	36	35	
54	Oxleas Wood	Wv	lids	Low	191	21	32	
64	Oxleas Wood	Wl	oldoak	Low	216	29	30	
14	Hampstead Heath (sect.2)	Gl	03	Low	549	45	27	0.09
31	Hampstead Heath (sect.5)	Gsh	543	Medium	350	35	21	0.06

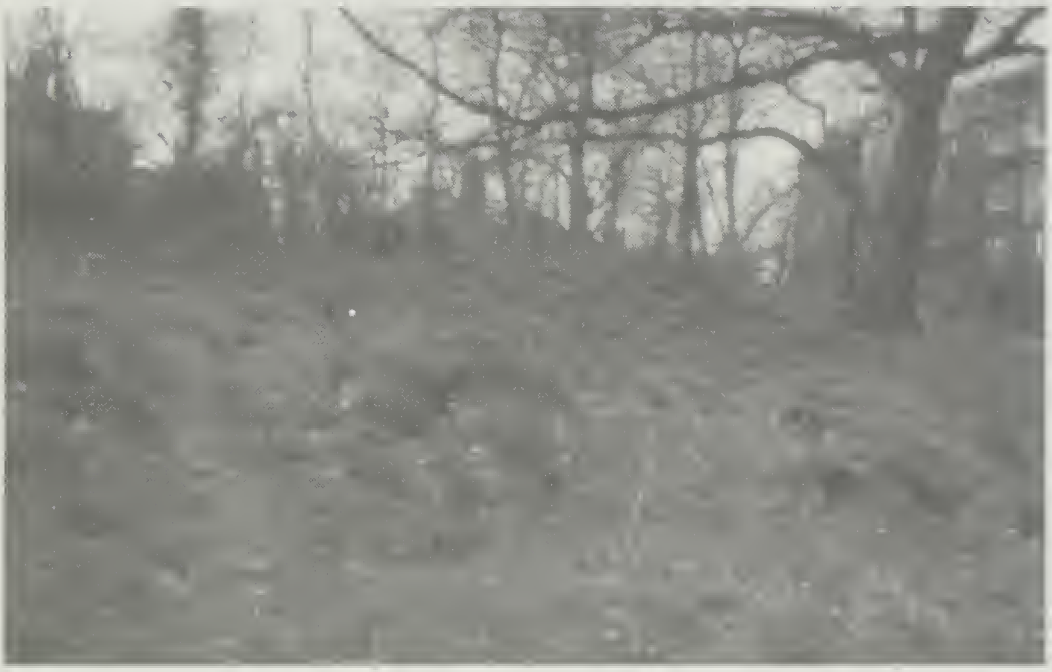

FIGURE 2. Hampstead Heath: The Battery woods. Shaded (long) grass, medium disturbance.

TABLE 8. Spiders at richest and poorest sites in each habitat category.

a — Grassland

	Richest 6 sites		**Poorest 6 sites**	
(group 1)	sites	nos.	sites	nos.
P. degeeri	6	327	6	435
P. pullata	5	445	6	99
P. palustris	3	16	4	237
A. pulverulenta	4	394	5	2
T. terricola	6	101	1	21
(group 2)				
O. fuscus	1	1	5	1,821
O. retusus	absent		3	103
E. dentipalpis	4	15	5	629
E. atra	5	15	4	250
L. tenuis	6	78	6	204
B. gracilis	4	15	6	70
M. inerrans	1	1	4	99
(group 3)				
X. cristatus	5	93	1	9
P. juncea	5	53	1	2
W. acuminata	5	38	2	10
E. thoracica	5	28	1	3
L. ericaeus	5	19	3	39
M. herbigradus	4	101	3	13
M. rurestris	4	10	2	9
M. viaria	4	36	1	1
S. lineatus	4	37	2	6
L. flavipes	4	21	3	15
W. antica	4	12	1	2
(group 4)				
C. bicolor	5	58	5	58
T. vagans	4	71	4	63
(group 5)				
D. brevisetosum	2	3	4	89
G. vivum	1	9	4	10
(group 6)				
E. frontalis	5	24	absent	
P. festivus	4	55	absent	
H. nava	4	61	absent	
R. lividus	4	20	absent	
P. sulcifrons	4	22	absent	
M. beata	4	6	absent	
C. concinna	4	56	absent	

b — Woodland

	Richest 5 sites n=5		**Poorest 5 sites** n=5	
D. picinus	5	381	5	78
M. viaria	5	149	5	164
L. zimmermanni	4	73	5	123
L. flavipes	5	135	4	74
Cl. terrestris	4	5	2	4
W. acuminata	4	49	3	25
M. sundevalli	4	38	2	12
M. fuscipes	4	10	4	182
M. herbigradus	4	7	1	7
M. rufus	4	98	2	3
B. gracilis	5	27	1	1
D. concolor	4	40	4	46
L. tenuis	5	55	2	9
L. pallidus	3	4	4	16

c — Scrub

	Richest 3 sites	
P. pullata	3	97
M. viaria	3	97
A. pulverulenta	3	69
T. terricola	3	37
M. rufus	3	34
L. zimmermanni	3	32
L. ericaeus	3	31
L. flavipes	3	30
W. cucullata	3	28
P. gibbum	3	27
W. acuminata	3	27
L. tenuis	3	24
T. vagans	3	14
D. picinus	3	11
E. furcata	3	8
S. lineatus	3	5

d — Wetland

	Richest 3 sites	
D. picinus	3	180
B. gracilis	3	175
D. concolor	3	56
P. clercki	3	53
O. retusus	3	24
M. herbigradus	3	17
W. acuminata	3	13
L. ericaeus	3	11
P. degeeri	3	7

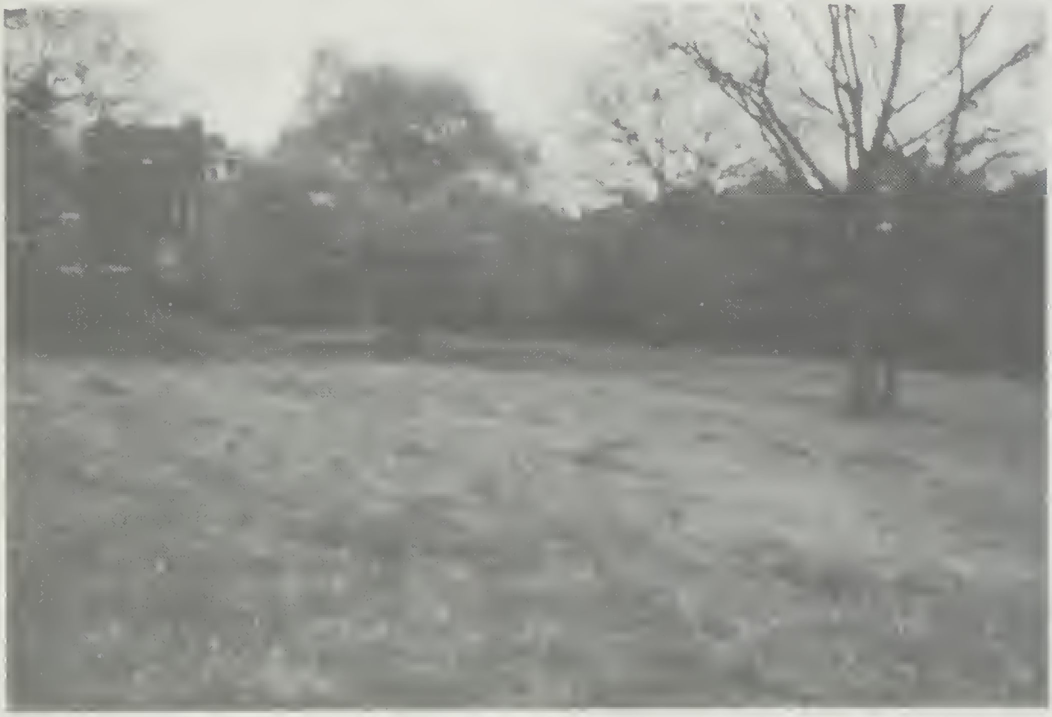

FIGURE 3. Hampstead Heath: west side of Kite Hill. Long grass, high disturbance.

A provisional checklist of larger Brachycera and Conopidae (Diptera) for vice-county 17, Surrey

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Summary

Available literature and database records for the larger Brachycera and Conopidae of vice-county 17, Surrey, are reviewed and presented as a provisional checklist. A total of 118 species are listed, of which seven are unconfirmed identifications. This checklist compares favourably with the national list and Surrey is rich in species which favour heathlands, chalk downland and woodlands, but species associated with base-rich wetlands and coastal habitats are not so extensively represented. The need for new data for the production of a county atlas in the Surrey atlas series is highlighted and contributions are invited.

Introduction

After the hoverflies, the larger Brachycera and Conopidae are amongst the most popular flies, collected and studied by a wide range of dipterists and amateur naturalists even though some, such as the horseflies, are notoriously difficult to identify. A number of the most spectacular species are illustrated in Colyer and Hammond (1968), but an illustrated key has been long awaited and is soon to be fulfilled by a new book on the larger Brachycera by Alan Stubbs and Martin Drake (in press).

The larger Brachycera include some of the most attractive and easily recognizable flies, but this is an artificial grouping which is in fact a sub-set of the Brachycera comprising the Xylophagoidea, Tabanoidea, Stratiomyoidea, Nemastrinoidea, and Asiloidea (as listed in Chandler 1998). Like the hoverflies, the larger Brachycera exhibit a wide range of life histories ranging from detritivores to active predators of soil-dwelling invertebrates, and parasites of larvae of the Hymenoptera and Lepidoptera. Many are useful indicators of particular geological and hydrological conditions. The Conopidae is a small family ranging from striking black and yellow wasp mimics to small dark species, all of whose larval life histories are poorly documented, but they are known to be internal parasites of adult bees and wasps.

In his key to the larger Brachycera, Oldroyd (1969) commented that ‘it will probably never be possible to compile a Vice-County list of the species of Brachycera, and if it were it would be of little value’. Since then, biological recording has evolved considerably with the advent of active recording schemes based on computerized datasets, and the increasing number of dipterists regularly reporting their finds. Furthermore, the publication of the UK Biodiversity Action Plan (DoE 1994, 1995) places emphasis on action to safeguard a selection of plants and animals thought to need help, amongst which are a number of larger Brachycera. These factors mean that there is an increasing opportunity and need to report on the faunas of individual counties. Checklists such as this are a starting point which will hopefully stimulate greater activity and reporting. Eventually a county atlas may be produced to complement *Hoverflies of Surrey* (Morris 1998).

At the moment, however, detailed knowledge of the distribution of these flies at vice-county level is poor. A trawl of the popular journals reveals surprisingly few records of larger Brachycera and especially few of the Conopidae from Surrey, but this situation is no different from most other counties. The most useful checklist is provided by Drake (1991) who lists 81 species of larger Brachycera. Previous checklists for the Asilidae of Surrey (17 species) (Parmenter and Oldroyd 1940) and the Conopidae of the London Natural History Society recording area (nine species) (Parmenter 1952) are helpful but obviously outdated, whilst the checklist of 95 species of larger Brachycera from the LNHS recording area (Plant 1990) simply covers the London suburbs and north-east Surrey.

Analysis

At the moment I hold some 2,200 records which include data recently supplied to the larger Brachycera recording scheme (subsequent to the computerization of data by the Biological Records Centre at Monks Wood for the provisional atlas (Drake 1991)), data supplied for the production of the BRC provisional atlas, the available published records trawled so far from some 110 papers and notes, records collected whilst I was recording hoverflies, and records forwarded by a number of Surrey recorders who have not contributed directly to the national scheme.

TABLE 1. Representation of the British fauna in Surrey.

Family	Total accepted species recorded in Surrey 1818–1979	1980–1999	Total of British species	% of British species recorded from Surrey	Records to be confirmed
Xylophagidae	—	1	3	33	—
Athericidae	1	2	3	100	—
Rhagionidae	—	10	15	67	—
Tabanidae	—	14	30	47	1
Xylomyidae	1	1	3	67	—
Stratiomyidae	2	28	48	63	3
Acroceridae	1	2	3	100	—
Bombyliidae	2	2	9	44	1
Therevidae	1	4	14	36	1
Scenopinidae	1	1	2	100	—
Asilidae	2	18	29	69	—
Conopidae	1	16	24	67	1
Totals	**12**	**99**	**183**	**61**	7

Unlike the hoverflies, which are readily attracted to lures such as flowering plants, the larger Brachycera are often more difficult to locate as adults, so it is unlikely that many families will be as well covered by recording for a full atlas. Adult Conopidae are flower visitors, but many are highly localized or have short emergence periods, so they too will be difficult to cover in great detail. Even so, a substantial assemblage of larger Brachycera and Conopidae comprising some 118 species is currently known, although some must be considered doubtful until specimens can be located and/or checked. The absence of many coastal species from the recording area is not surprising given the landlocked nature of Surrey and this in part reflects the lower representation of some families than might be expected elsewhere in the UK. In the past, however, the tidal Thames did support coastal habitats as far as Surrey, and this may be a factor behind historic records of some coastal species. Furthermore, the Chalk in Surrey has few active springs or seepages, and other rocks give limited scope for base-rich seepages favoured by many Stratiomyidae. On the positive side, Surrey is rich in heathland, chalk downland, and woodland which is reflected in other elements of the larger Brachycera and Conopidae fauna. Overall comparison with the British fauna is illustrated in Table 1. Many species appear to be holding their own, but there are others, especially those associated with wetlands, which seem to have declined significantly. The low frequency of some species of horseflies (Tabanidae) is especially noteworthy as the published literature suggests that the family was formerly more abundant; this apparent decline possibly reflects the joint effects of increased drainage and declining livestock numbers in the wider countryside. Remarkably, however, the assemblage does not seem to have changed in terms of overall representation.

It is too early to make any detailed comments on the distribution and frequency of many species because few are particularly well recorded, but there is good evidence of defined distributions for species associated with rivers, wetlands, chalk downland and heathland. Interpretation of the geology of Surrey can be found in Morris (1998) and it is this which the following analysis is based upon.

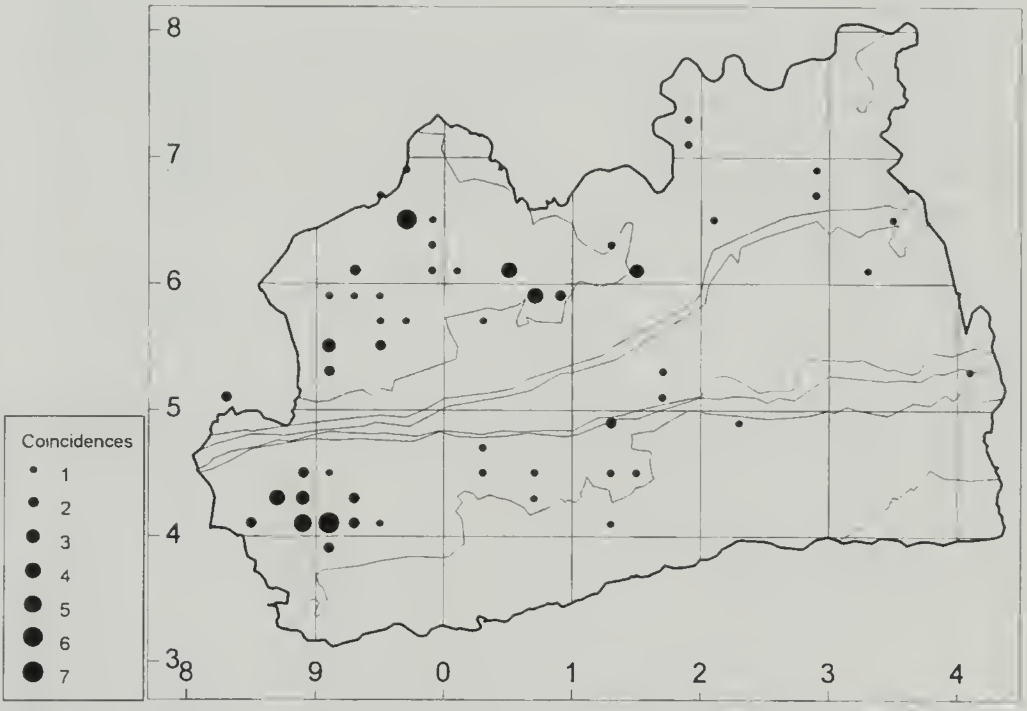

FIGURE 1. Coincidence map of species proposed as heathland indicators for Surrey. This shows a concentration of species on the Lower Greensand and Bagshot Sand with scattered records from the Thames basin gravels and drift overlying the Chalk.

Figure 1, depicting a selection of possible heathland indicators (Table 2), shows that there are species which may be closely associated with heathland, chiefly on the Bagshot Sand and Lower Greensand, but also on the Thames basin gravels and drifts overlying the Chalk. The highest concentrations of possible indicators come from important heathland sites such as Thursley/Hankley Commons, Chobham and Wisley Commons and the

Pirbright Ranges. But, many are unlikely to be confined strictly to a particular vegetation type; drainage, aspect and vegetation density and height being further determining factors which are in themselves reflections of well-drained surface geology. Species associated with Chalk habitats (Table 3) are possibly better defined as shown on Figure 2, but even so there are disparities. In this case, the highest concentrations of possible indicators come from sites such as Riddlesdown, Box Hill and The Sheepleas and others along the Chalk scarp. There is also a need to make a clear distinction between phytophagous species which may be associated with calcicoles or calcifuges, species with associations with other specialist species, and species whose larval stages are more closely associated with soils with particular characteristics such as rapid rates of warming and high drainage. The picture is therefore more complicated than might at first appear.

TABLE 2. Species selected as possible heathland indicators and used to compile Figure 1.

Atylotus fulvus (Tabanidae)
Beris clavipes (Stratiomyidae)
Thyridanthrax fenestratus (Bombyliidae)
Thereva bipunctata (Therevidae)
Eutolmus rufibarbis (Asilidae)
Machimus cingulatus (Asilidae)
Lasiopogon cinctus (Asilidae)
Conops vesicularis (Conopidae)
Myopa fasciata (Conopidae)

TABLE 3. Proposed indicators for Chalk habitats in Surrey and used to compile Figure 2.

Rhagio strigosus (Rhagionidae)
Symphoromyia immaculata (Rhagionidae)
Tabanus glaucopis (Tabanidae)
Machimus rusticus (Asilidae)
Leptarthrus brevirostris (Asilidae)
Leptarthrus vitripennis (Asilidae)
Thecophora atra (Conopidae)

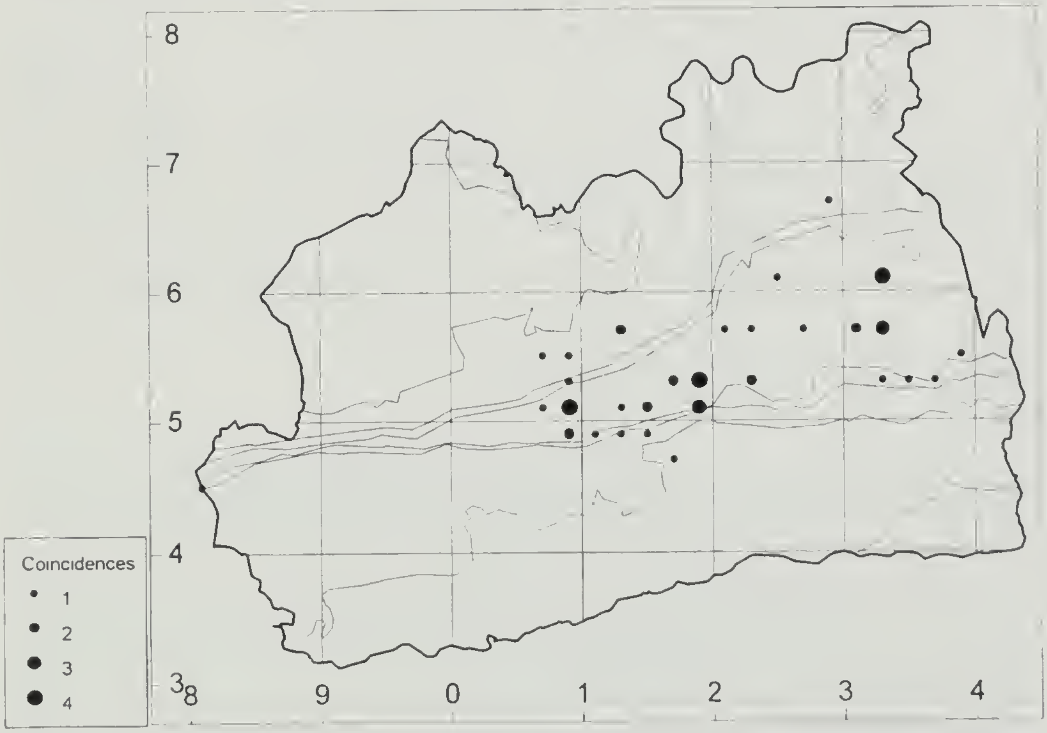

FIGURE 2. Coincidence map of species proposed as chalk downland indicators for Surrey.

This reflection of the role of geology in defining species distribution is demonstrated by combining the thermophilic (species which favour warmer environments) components of the list of possible heathland and chalk downland indicators with a variety of other thermophilic species (Table 4), as shown in Figure 3. This third map shows the widespread distribution of probable thermophilic species, some of which are confined more or less to the Chalk and others to sandy sites, but many such as *Asilus crabroniformis* may simply reflect the presence of well-drained soils. Overall, these species are seemingly confined to soils with a high sand content or high porosity such as Chalk; the absence of these species from the wealden clays to the south of the Chalk and Lower Greensand clearly shows the importance of soil type and drainage to many of the species for which Surrey is noteworthy.

TABLE 4. Species selected to demonstrate associations with probable thermophilic habitats in Figure 3.

Paracrocera orbiculus
Ogcodes gibbosus
Ogcodes pallipes
Thyridanthrax fenestratus
Thereva bipunctata
Thereva plebeja
Asilus crabroniformis
Dysmachus trigonus
Eutolmus rufibarbis
Machimus cingulatus
Machimus rusticus
Lasiopogon cinctus
Conops vesicularis
Myopa fasciata
Thecophora atra
Sicus abdominalis

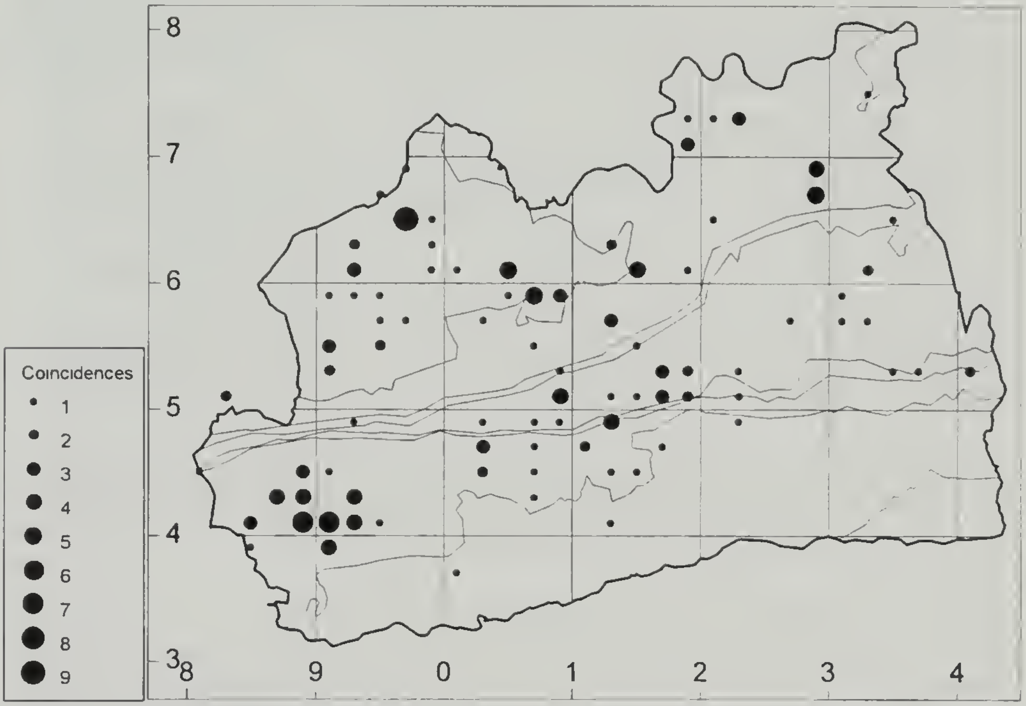

FIGURE 3. Coincidence map of possible thermophilic species recorded in Surrey. This shows how other elements of sandy and gravel drift deposits can be highly influential in the distribution of species which favour dry, well-drained soils which warm up quickly.

At the moment there are a small number of sites which have been recorded sufficiently to give a picture of the likely size of overall assemblages. As might be expected, Great Bookham Common, with forty-nine species, ranks amongst the best-recorded sites, but others include Thursley Common, Wisley

Common/RHS Gardens and Mitcham Common. Few sites have a well-recorded Conopidae fauna, but the heathlands and chalk downlands should prove to be rich, and indications from Mitcham and Great Bookham Commons suggest that between eight and ten species are likely from rich and well-recorded sites.

Literature records give some indication of the data available on flower visits by larger Brachycera and Conopidae, and the prey assemblage favoured by the Asilidae, but it is clear is that there is considerable scope to improve the published records with contributions of detailed records of flower visits and the prey of Asilidae.

As with the hoverflies, the biggest challenge will be to ensure that the London suburbs are covered adequately, and anyone (including non-dipterists) who feels that they might be able to help are invited to contact me (bee-keepers please note the account for *Scenopinus fenestralis*). I would be particularly pleased to hear from readers who live in the London suburbs of VC17 who would be prepared to run water-traps in their gardens. Data arising from these traps would be used to expand the coverage of this and other Surrey schemes such as that for the bees, wasps and ants which are more advanced in their state of preparation.

Species accounts

The species accounts cover all species for which I have identified a record and follow the nomenclature in Chandler (1998). Some of these are very old and, given the difficulty many families present for identification, some records should be treated with caution as I have indicated in the accounts. Species marked with an asterisk have no records from 1980 onwards, and those accounts in brackets are for species whose occurrence in Surrey is doubted. In the species accounts a record is normally accompanied by the name of the recorder abbreviated to initials which are indicated below:

K. N. A. Alexander (KNAA)
D. W. Baldock (DWB)
A. Beaumont (AB)
P. L. T. Beuk (PLTB)
J. H. Bratton (JHB)
P. J. Chandler (PJC)
D. K. Clements (DKC)
G. A. Collins (GAC)
J. S. Denton (JSD)
J. R. Dobson (JRD)
H. C. Eve (HCE)
R. Fry (RF)
A. Godfrey (AG)
A. J. Halstead (AJH)
C. O. Hammond (COH)
P. Harvey (PH)
C. Hart (CH)
R. D. Hawkins (RDH)
P. J. Hodge (PJH)
Mrs G. Jeffcoate (GJ)
P. Kirby (PK)
S. Lambert (SL)
D. C. Lees (DCL)
R. K. A. Morris (RKAM)
M. S. Parsons (MSP)
L. Parmenter (LP)
C. W. Plant (CWP)
J. H. P. Sankey (JHPS)
G. Shephard (GS)
T. J. Smith (TJS)
A. E. Stubbs (AES)
R. W. J. Uffen (RWJU)

Where species are recognized to be of particular conservation interest, the status as listed (*Red Data Book* and Nationally Scarce) by Falk (1991) is also included. *Red Data Book* (*RDB*) categories are sub-divided into the following categories representing the degree of perceived threat:

RDB 1 — Endangered. Taxa in danger of extinction.

RDB 2 — Vulnerable. Taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating.

RDB 3 — Rare. Taxa with small populations that are not at present Endangered or Vulnerable, but are at risk.

RDB **K** — Insufficiently Known. Taxa which are thought to fall within one of the three categories above, but for which data are insufficient to ascribe a *Red Data Book* status.

Nationally Scarce was formerly listed as Nationally Notable but changed to Nationally Scarce to maintain consistency with statuses used for plants.

XYLOPHAGIDAE

Xylophagus ater Meigen, 1804. Recorded mainly from broadleaved woodland where adults are often noted 'dancing' up tree trunks in dappled sunlight. Probably widespread but difficult to find in numbers as adults.

ATHERICIDAE

Atherix ibis (Fabricius, 1798). Known from Thundry Meadows and the Elstead area on the River Wey, with published records by Dobson (1992) and Denton and Fry (1997). Likely to be more widespread along the Wey and perhaps the Tillingbourne.

Atrichops crassipes (Meigen, 1820)* — ***RDB*** **3**. According to Falk (1991) this species has been recorded from the River Wey.

Ibisia marginata (Fabricius, 1781). Known from two sites on the River Wey; Eashing SU9443 (18.vii.1995 (Denton and Fry 1997)) and Charterhouse Alder Holt SU9544 (10.vii.1994, 11.vii.1994, JRD); and also from Frillinghurst Woods SU9234 (1991, JSD).

RHAGIONIDAE

Chrysopilus asiliformis (Preyssler, 1791). Few available records, but possibly overlooked.

Chrysopilus cristatus (Fabricius, 1775). Widespread in wetlands and damp woodlands.

Ptiolina obscura (Fallén, 1819) — **Nationally Scarce**. Just a single record: Sheepleas TQ0951 (11.vi.1988, AJH).

Rhagio annulatus (De Geer, 1776) — ***RDB*** **3**. This is a very distinctive species which is readily distinguished from *R. tringarius*. It is known from just a few records: the Sheepleas (Chandler 1983); Broadham Green TQ3851 (31.v.1994, RKAM); St Johns Wood, Dormansland TQ4141 (8.vi.1999, GAC).

Rhagio lineola Fabricius, 1794. Few records at present, but likely to be widely distributed.

Rhagio notatus (Meigen, 1820)*. A single published record from Godalming (Oldroyd 1969) based on records from Charterhouse Alder Holt (2.vi.1967, AES; May 1967, June 1968, PJC)of this mainly northern species. Alan Stubbs (pers. comm.) reports that this species has not been seen since the dredging of the River Wey as part of the flood alleviation scheme for Godalming; it is possible that this action has led directly to the loss of *R. notatus* in Surrey and illustrates the vulnerability of riverine species to bank and channel modifications.

Rhagio scolopaceus (Linnaeus, 1758). Obviously common in the west of Surrey, but poorly represented in central Surrey and apparently scarce on the Chalk.

Rhagio strigosus (Meigen, 1804) — ***RDB*** **3**. Until 1999, Box Hill was to be the only locality for this species in Surrey, with a series of records dates ranging from 29.vii.1954 (Kidd 1955, Parmenter 1955, Skidmore 1955) to 24.vii.1997 (Alexander and Foster 1998). However, in 1999 two specimens were also taken by G.A. Collins from Headley Heath TQ1953 (5.vi.1999, 12.vi.1999).

Rhagio tringarius (Linnaeus, 1758). Widespread, but less frequent than *R. scolopaceus*.

Symphoromyia immaculata (Meigen, 1804) — **Nationally Scarce**. Seemingly widespread on the Chalk scarp grasslands from the Sheepleas to Woldingham.

TABANIDAE

Chrysops caecutiens (Linnaeus, 1758). Apparently scarce, but probably under-recorded. Modern records are concentrated in south and south-west Surrey, but historically this species was known north of the Downs and it seems likely that this distribution will be reflected given more intensive recording. Recorded at hemlock water-dropwort *Oenanthe crocata* (RDH).

Chrysops relictus Meigen, 1820. Slightly scarcer than *C. caecutiens*, but also likely to be under-recorded. Seemingly confined to western Surrey, but current levels of recording may mean that this apparent distribution is artificially skewed by recorder effort.

Chrysops viduatus Fabricius, 1794. Very scarce, just three modern records. Seemingly confined to sandy acidic sites in Surrey.

Haematopota crassicornis Wahlberg, 1848. Considerably scarcer than *H. pluvialis*, seemingly more common in the south-west. Current records suggest that this species is associated with sandy, acidic sites.

Haematopota pluvialis (Linnaeus, 1758). Widespread; the commonest of the Tabanidae in Surrey.

Atylotus fulvus (Meigen, 1804) — **Nationally Scarce**. Known only from Thursley Common (23.vii.1967, COH), SU9140 (1989–1991, JSD), although it seems likely that this species might occur more widely on the wetter Surrey heaths.

Hybomitra bimaculata (Macquart, 1826). The commonest large horsefly in Surrey today, but represented by very few records; many, but not all, of which are from heathland.

Hybomitra distinguenda (Verrall, 1909). Very few records, mostly from south-west Surrey.

Tabanus autumnalis Linnaeus, 1761. Just a single published record — a female from Bookham Common (Parmenter 1966), but seemingly better known from west Surrey where there are records from three heathland sites.

[*Tabanus bovinus* Linnaeus, 1761* — ***RDB*** **K**. Verrall (1909) confidently reports this species from Surrey, but Drake (1991) suggests that there are actually very few confirmed records for Britain and this casts doubt on Verrall's reports from Oxshott and Farnham. Most records are likely to be *T. sudeticus*.]

Tabanus bromius Linnaeus, 1758. Kirkpatrick (1918) reports this species from Leith Hill, where males were 'common . . . resting on pales', and there are a number of other published records which suggest that this is one of the species which has declined with agricultural change. There is just a single modern record: Swan Barn Farm SU9132 (14.viii.1983, KNAA/DKC).

Tabanus glaucopis Meigen, 1820 — ***RDB*** **3**. Although obviously scarce, this species seems to be well established in the Box Hill/Mickleham area. On 19.vii.1998 several individuals were attracted to a marquee at Juniper Hall (TQ1752, GAC/RKAM).

Tabanus maculicornis Zetterstedt, 1842. Reported in the literature from a number of localities but today known from just a few sites mainly in west Surrey where it is probably more widespread on heathlands than current records suggest.

Tabanus miki Brauer, in Brauer & von Bergenstamm, 1880 — ***RDB*** **K**. A single female from Buckland (24.v.1997, CH det., confirmed AES).

Tabanus sudeticus Zeller, 1842. Probably formerly widespread if the records ascribed to *T. bovinus* listed in Verrall (1909) are considered to be *T. sudeticus*. There are a number of records for Thundry Meadows SU8943/8944 (1990–1997, JSD), and a single record from Knaphill SU9658 (July 1992, TJS det., CMD).

XYLOMYIDAE

Solva marginata (Meigen, 1820) — **Nationally Scarce**. Probably widespread in urban areas where poplars are planted in parks and cemeteries.

Xylomya maculata (Meigen, 1804)* — ***RDB*** **2**. There is a single record of a female bred from 'fungus impregnated wood' from the trunk of a partly decayed beech tree at Virginia Water collected on 8.iii.1933 which emerged on 6.v.1933 (Richards 1934).

STRATIOMYIDAE

Beris chalybata (Forster, 1771). Widespread and common.

Beris clavipes (Linnaeus, 1767) — **Nationally Scarce**. Seemingly very scarce and restricted to west Surrey where it may be closely associated with heathland. One modern site: Thursley NNR, 18.vii.1993 (Denton and Fry 1997).

Beris fuscipes Meigen, 1820 — **Nationally Scarce**. Nationally, this species has a distinctly western distribution, but there is a record for Surrey: Knaphill SU9659 (6.vii.1991, AJH).

Beris geniculata Haliday, in Curtis, 1830. Just three modern records. Possibly more widespread, but certainly not common.

Beris morrisii Dale, 1841. Widespread, but not common.

Beris vallata (Forster, 1771). After *B. chalybata* this is the commonest of the genus in Surrey.

Chorisops nagatomii Roskošný, 1979 — **Nationally Scarce**. Probably a good deal more common than records suggest. I have taken it at Farnham, River Wey SU8504 (15.viii.1992); Seale SU8847 (15.viii.1992); near Hungry Hill TQ0555 (23.viii.1992) and Mitcham Common TQ2867 (27.viii.1991).

Chorisops tibialis (Meigen, 1820). Widespread but not common.

[*Clitellaria ephippium* (Fabricius, 1775). Reported by Verrall (1909) from a 'Coombe Wood', reputedly in Surrey, but Oldroyd (1969) suggests this site is near Deal, so we cannot be sure of the true location. If ever resident, *C. ephippium* is certainly extinct.]

Nemotelus pantherinus (Linnaeus, 1758). Two records, one from Thundry Meadows SU8944 (26.vi.1991, JRD) on the River Wey, and another surprising record from Morden Hall Park TQ2568 (19.vii.1989, KNAA) on the River Wandle. Further search along the River Wey floodplain would be worthwhile.

Oxycera nigricornis Olivier, 1812. Known from a small number of sites ranging from vegetated river margins to flushed fens. Possibly overlooked as a chloropid as it is small, colourful and often abundant where found. Modern records include: Tuesley SU9642 (15.vii.1989, RKAM); Charterhouse Alderholt SU9544 (11.vii.1994, JRD); Godalming SU9643 (27.vi.1993, JRD); Cobham TQ1060 (19.vii.1989, RKAM).

Oxycera rara (Scopoli, 1763). Scarce, but known from a number of similar sites to *O. nigricornis*. Modern records include: Waverley Abbey SU8745 (6.viii.1988, RKAM/GAC); Tuesley SU9642 (15.vii.1989, RKAM).

[*Oxycera terminata* Meigen 1822* — ***RDB*** **2**. A single record from Oxshott (8.vii.1891 (Billups 1891)). This is a species which is associated with base-rich streams and rivers and is therefore highly unlikely to have occurred at Oxshott; this record is therefore extremely doubtful.]

Oxycera trilineata (Linnaeus, 1767). Verrall (1909) lists Surrey amongst the counties where this species has been recorded, but the only record of which I am aware is from Wisley RHS Gardens TQ0658 (23.vi.1988, AJH).

Vanoyia tenuicornis (Macquart, 1834) — **Nationally Scarce**. Represented by a single post-1980 record: Cobham TQ1060 (19.vii.1989, RKAM).

Neopachygaster meromelas (Dufour, 1841) — **Nationally Scarce**. A species which may be more abundant than records suggest, given that it appears to be associated with poplars which are widespread in urban areas. Three post-1980 records: Wisley RHS Gardens TQ0658 (22.vii.1986, AJH (Halstead 1987)); Richmond Park (6.vi.1992, PJC (Miles 1993)); Nunhead Cemetery TQ3475 (27.vii.1991 (Jones 1992)).

Pachygaster atra (Panzer, 1798). Widespread and common, usually swept from foliage.

Pachygaster leachii Stephens, in Curtis, 1824. Widespread, usually swept from foliage.

Zabrachia tenella (Jaennicke, 1866) — **Nationally Scarce**. Taken as larvae by Paul Beuk at a number of localities in 1989: Walton on the Hill, West End Common and Esher Common (Beuk 1989). The larvae, which are to be found under the bark of dead pines, seem to be more straightforward to find than adults and will probably prove to be the main way of recording this species.

Chloromyia formosa (Scopoli, 1763). A common visitor to umbellifers. Flower visits noted include: ground elder *Aegopodium podagraria*, hemlock water-dropwort *Oenanthe crocata*, hemlock *Conium maculatum*, hogweed *Heracleum sphondylium*.

[*Microchrysa cyaneiventris* (Zetterstedt, 1842). I am aware of a number of Malaise trap specimens reported as this species which I feel should be checked before this is accepted as a Surrey species.]

Microchrysa flavicornis (Meigen, 1822). Rather scarce.

Microchrysa polita (Linnaeus, 1758). Widespread, often swept from foliage.

Sargus bipunctatus (Scopoli, 1763). Widespread, mainly in north-east Surrey; this probably reflects the late emergence of this species and my tendency to visit sites close to home in the autumn. Noted at ivy *Hedera helix* flowers.

Sargus cuprarius (Linnaeus, 1758). Listed from Surrey by Drake (1991). I have a specimen which seems to run to this species but needs checking.

Sargus flavipes Meigen, 1822. Just three post-1980 records: Thundry Meadows SU8943 (1990–1991, JSD); Holmen's Grove SU9236 (20.vi.1993, RKAM); Reffolds Copse TQ1843 (7.vi.1987, GAC).

Sargus iridatus (Scopoli, 1763). There would appear to be a very strong association with south-east Surrey where the soils are stiff and water-logged and mainly used as pasture for cattle.

Odontomyia argentata (Fabricius, 1794)* — ***RDB*** **2**. Known solely from Great Bookham Common where it was taken in the 1940s (Parmenter 1950).

Odontomyia ornata (Meigen, 1822)* — ***RDB*** **2**. Listed from Mitcham Common in 1900 by Shirt (1987) and 'Surrey' by Oldroyd (1969). This is a surprising record which I have yet to follow up and have some doubts about, given that this seems to be a grazing marsh species; it could, however, be a stray from the Essex coast or from former coastal wetlands now part of Greater London.

Odontomyia tigrina (Fabricius, 1775) — **Nationally Scarce**. Probably widespread where lush vegetation occurs around the edges of ponds. My own records include: Epsom Common TQ1860 (29.vi.1986, 11.vi.1987); Haxtead Mill TQ4145 (23.vi.1985); Wimbledon Common TQ2372 (27.v.1990); Mitcham Common, Goat Green TQ2866 (4.vi.1989).

Oplodontha viridula (Fabricius, 1775). Very few records, probably highly local. Records include: Eashing SU9443 (7.vii.1985, RKAM); Shalford, River Wey SU9947 (16.vi.1999, GAC); Guildford TQ0051 (22.vii.1989, RKAM); Bay Pond TQ3551 (6.vii.1985, RKAM). Noted at hogweed *Heracleum sphondylium* flowers.

Stratiomys potamida Meigen, 1822 — **Nationally Scarce**. Deceptively widespread because this is a conspicuous species which visits umbellifers and is noted by a wide variety of naturalists. My records include: Eashing SU9443 (7.vii.1985); Coxes Lock TQ0664 (5.vii.1987); Forest Green TQ1241 (27.viii.1985); Ashtead Common TQ1859 (26.vii.1987); St Joseph Hood Playing Field TQ2267 (24.vii.1987); Mitcham Common TQ2967 (2.viii.1991); Blindley Heath TQ3645 (27.vii.1986). Flower visits I have noted are: hogweed *Heracleum sphondylium* (2), hemlock water-dropwort *Oenanthe crocata*.

Stratiomys singularior (Harris, 1776) — **Nationally Scarce**. Known from a small number of sites in Surrey, but especially from Mitcham Common where it is known for a period spanning some twenty-two years: Mitcham Common TQ2867 (30.vii.1969, GS (Allen 1981)); TQ2868 (16.vi.1979, RKAM), TQ2967 (28.vii.1991, 27.vii.1991, RKAM); Beddington Sewage Farm TQ2866 (20.vi.1998, GAC). Noted visiting hogweed *Heracleum sphondylium* on most occasions.

ACROCERIDAE

Paracrocera orbiculus (Fabricius, 1787). Reported by Verrall (1909) from various south London sites. Just three post-1980 records: Cobham Common SU9765 (13.vii.1985, RDH); Richmond Park TQ27 (31.vii.1992, MSP); Mitcham Common TQ2867 (27.vii.1991, RKAM).

Ogcodes gibbosus (Linnaeus, 1758)* — **Nationally Scarce**. Verrall (1909) lists this species from a number of sites, including a very old record for Richmond Park (4.vii.1835, Hope Dept. Collection). The most recent record is for Mitcham Common (1975, Falk (1991)).

Ogcodes pallipes Latreille, in Olivier, 1812 — **Nationally Scarce**. There are very few records: Ham Common, Richmond TQ1871 (9.vii.1999, GAC); Box Hill TQ1751 (11.vii.1987, PK/SL); Coulsdon TQ3158 (4.vii.1954, RWJU); and a report by Wakely (1950) who reports finding at Warlingham a solitary wasp nest in a cavity in white mullein *Verbascum lychnitis* provisioned with 21 specimens of *O. pallipes*. Most of these records suggest that this species may be associated with Chalk sites, but more are needed before any firm conclusions can be drawn.

BOMBYLIIDAE

Bombylius discolor Mikan, 1796* — **Nationally Scarce**. At present known only from old records from Great Bookham Common (Plant 1990) and Limpsfield Common (Parmenter 1942).

Bombylius major Linnaeus, 1758. Abundant throughout much of Surrey. A regular flower visitor for which there are a number of published flower visit records. Recent flower visit records of which I am aware include: green alkanet *Pentaglottis sempervirens* (RKAM), lesser celandine *Ranunculus ficaria* (RDH), slender speedwell *Veronica filiformis* (RDH), germander speedwell *Veronica chamaedrys* (RDH), *Viburnum tinus* (RDH), cuckooflower *Cardamine pratensis* (RDH), ground ivy *Glechoma hederacea* (RDH) and white dead-nettle *Lamium album* (RDH).

[*Bombylius minor* Linnaeus, 1758 — ***RDB*** **2**. Reported from Surrey by Drake (1991), but a recent review (Stubbs 1996) found no evidence of accurate records of this species from Surrey.]

Thyridanthrax fenestratus (Fallén, 1814) — ***RDB*** 3. Figure 4. Seemingly widespread on many of the west Surrey heaths. Although reported to parasitize the digger wasp *Ammophila sabulosa*, the distribution of *T. fenestratus* seems more closely to match that of *A. pubescens* in Surrey. *T. fenestratus* is a species on the UK Biodiversity Action Plan, and detailed records of locations and associated behavioural observations would be especially useful in helping to understand its biology.

Villa venusta (Meigen, 1820)* — ***RDB*** 1. Reported from Chobham and Oxshott in Stubbs and Drake (in press), possibly extinct.

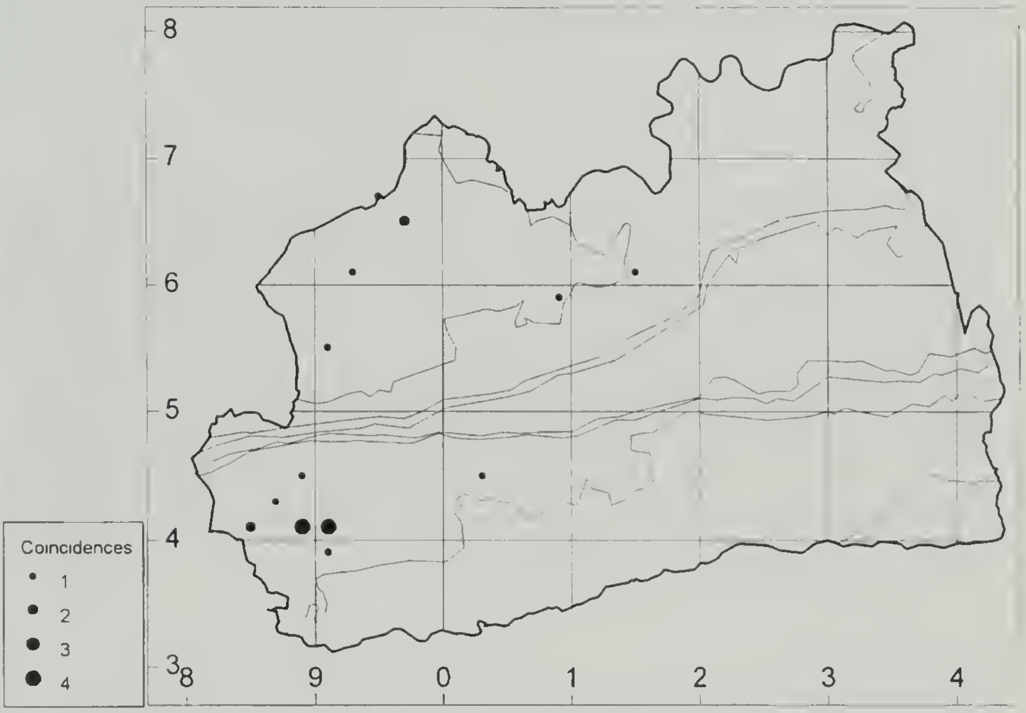

FIGURE 4. Coincidence map for yearly occurrence of *Tharidanthrax fenestratus* since 1955. This map suggests that *T. fenestratus* has its stronghold in the Thursley/Hankley area. Records from a number of more easterly sites, especially the Esher Common/Oxshott Heath area are old and this species may have disappeared from these sites which were heavily coniferized post-Second World War.

THEREVIDAE

Cliorismia rustica (Panzer, 1804) — ***RDB*** 3. A single record of a female at Charterhouse Alder Holt (15.vii.1989, PJC).

Pandivirilia melaleuca (Loew, 1847) — ***RDB*** 1. There is a tantalizing record of larvae (not reared) from red heart rot in oak at Richmond Park (Owen 1993) but, as the larvae cannot be identified at present, and *Thereva nobilitata* have been found and reared from similar habitat, this record should be treated with caution. At the moment the only confirmed record for Surrey is from Royal Holloway College (Ismay 1981).

Thereva bipunctata Meigen, 1820. Reported from the heathlands of west Surrey by Drake (1991), I have just a single modern record: Hankley Common SU8841 (1.vii.1989, RKAM).

[*Thereva fulva* (Meigen, 1804)* — ***RDB*** 3. There is a single record of this species from Oxshott by Billups (1891) whose note includes a number of other surprising records; this must therefore be considered doubtful.]

Thereva nobilitata (Fabricius, 1775). Widespread and not uncommon.

Thereva plebeja (Linnaeus, 1758) — **Nationally Scarce**. Modern records suggest that *T. plebeja* is well established in west Surrey on sandy sites. Reported bred from Epsom by Prof. J. A. Owen (Allen 1991). The specimen reported from Thundry Meadows (Dobson 1992) has since been redetermined as *T. nobilitata* (J. Dobson pers. comm.).

SCENOPINIDAE

Scenopinus fenestralis (Linnaeus, 1758). Reported by Plant (1990) as 'widespread and very common' in the LNHS recording area, but the only modern records from Surrey are: Thursley Village SU9039 (16.ii.1992, in house (Denton and Fry 1997)); Fernhill TQ3041 — on mugwort *Artemisia vulgaris* (12.vii.1993, RDH). A recent account by Dobson (1999) suggests that this species has an association with beehives where it is likely to be predacious on the larvae of insects which live in association with bees' nests; it may prove to be a lot more abundant if the detritus from beehives is examined and any larvae are bred out. I would therefore welcome samples of the 'rubbish' cleared from hives by bee-keepers which may lead to a better understanding of this species' biology.

Scenopinus niger (De Geer, 1776)* — **Nationally Scarce**. Listed from 'Greenings' by Verrall (1909).

ASILIDAE

Asilus crabroniformis Linnaeus, 1758 — **Nationally Scarce**. Figure 5. This is an easily identified species on account of its size and distinctive coloration. It is well known from the Thursley/Hankley area and regularly recorded from Horsley by H.C. Eve, but has seemingly disappeared from other downland haunts. There are records from the London area which suggest that this is either a highly mobile vagrant or that there are small relict populations on some of the south London commons. Records for late May and early June are remarkably early but they do seem to be confined to years when there was exceptionally hot weather in April and May which accelerated emergence in a number of species, especially hoverflies and perhaps the Asilidae. This species is currently being studied in detail as part of work on the UK Biodiversity Action Plan. Detailed records are therefore most welcome, especially as relict populations may exist on the commons of south London. Modern records include: Hankley Common SU8840 (1.vii.1989, JHB; 19.viii.1998, GAC), SU8841/8940/9040 (undated (Denton and Fry 1997)), SU8841 (30.vii.1999, GAC); Thursley Common SU9139 (3.viii.1995,

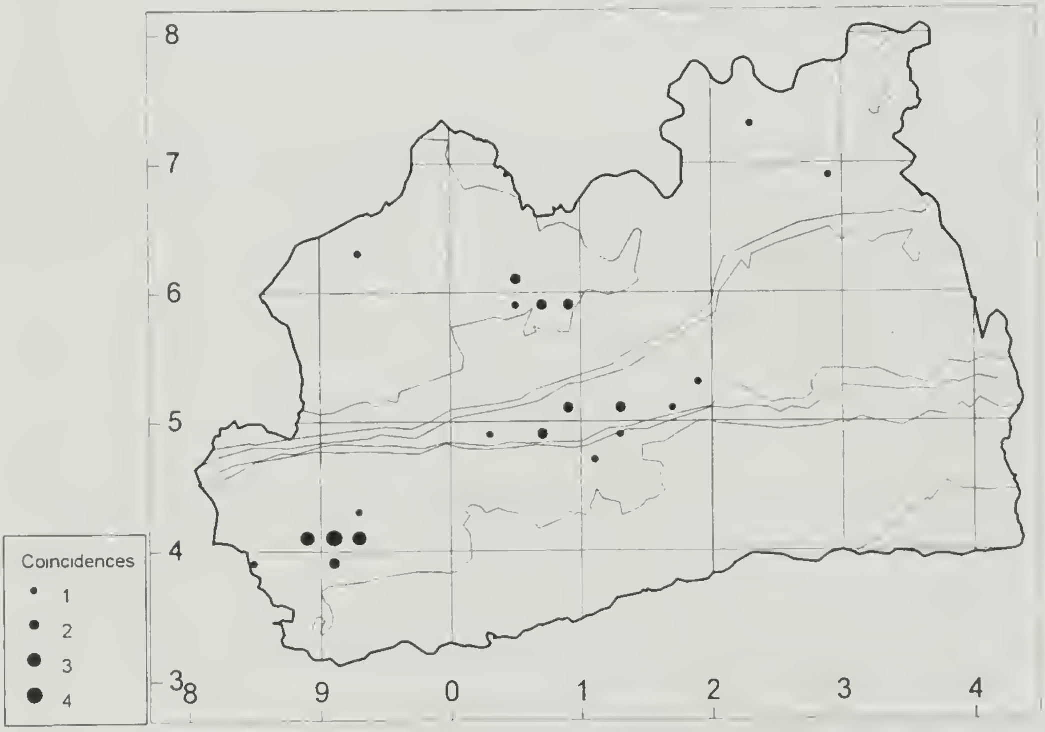

FIGURE 5. Coincidence map for yearly occurrence of *Asilus crabroniformis* since 1931. This shows a heavy concentration of records around Thursley/Hankley Commons and the Chalk west of the Mole gap. Formerly, this species was well established in the Wisley/Ockham area but there are no recent records.

RKAM; 2.x.1988, GAC), SU9040 (30.vii.1999, 3.ix.1999, GAC); Bagmoor Common SU9242 (19.viii.1998, GAC); Oxted Green SU9340 (8.v.1993, JRD);Witley Common SU9341 (24.v.1992, JRD), SU9340 (vi–x.1992–1996 (Denton and Fry 1997)); Lightwater Country Park SU9262 (17.vi.1990, JRD); Newlands Corner TQ0349 (22.v.1991, JRD); Netley House TQ0748 (5.vi.1993, 17.vi.1991, JRD), (12.vi.1993, AJH); Horsley TQ0951 (numerous records, HCE); Abinger Roughs TQ1047 (12.vi.1993, AJH); Westcott Downs TQ1350 (16.viii.1999, GJ); Wimbledon Common TQ2373 (27.v.1990, JRD); Mitcham Common TQ2968 (29.viii.1991, DCL).

Dysmachus trigonus (Meigen, 1804). Rather scarce, seemingly concentrated on sandy sites on the Bagshot Sand, Lower Greensand and Thames basin gravels.

Eutolmus rufibarbis (Meigen, 1820) — ***RDB*** **3**. Seemingly widespread on the west Surrey heaths but also from one downland site (White Downs, viii.1991, JSD — in *Larger Brachycera Recording Scheme Newsletter* 9). Unpublished records include: Spur Hill SU9054 (16.vii.1994, RKAM); Bagmoor Common SU925424 (17.vii.1999); Pirbright Common SU9555 (14.viii.1994, GAC); Brookwood Cemetery SU9656 (30.vi.1998, DWB); Chobham Common SU9665 (16.viii.1981, with *Apis mellifera* prey item, PH).

Machimus atricapillus (Fallén, 1814). Widespread and common on dry heathlands, chalk grasslands and sandy sites.

Machimus cingulatus (Fabricius, 1781). Widely distributed across the Bagshot Sand and Lower Greensand.

Machimus rusticus (Meigen, 1820) — ***RDB*** **2**. Known from chalk downland at the Sheepleas (23.vi.1990, AJH (Halstead 1991)) and White Downs (1992–1993 (Denton and Fry 1997)). Possibly more widespread than current records suggest.

Neoitamus cyanurus (Loew, 1849). Widespread but not common, in woodlands. I took a specimen at a mercury vapour light at Friday Street TQ1245 (23.vi.1981).

Leptarthrus brevirostris (Meigen, 1804). Widely distributed across the North Downs.

Leptarthrus vitripennis (Meigen, 1820). Currently known only from a series of downland sites (Hawkins 1998): Box Hill (20.vi.1948, OWR in NHML); White Downs (14.viii.1988, AJH); Riddlesdown (1.vii.1996, beaten from juniper bush, RDH).

Choerades gilvus (Linnaeus, 1758) — ***RDB*** **K**. Recorded from a number of sites in Surrey in the 1940s and early 1950s. The disappearance of this species is curious as it appears to have been widespread for some time, associated with conifers on heathland. The records include four larvae taken from pine bark at Ash Vale (Duffy 1946) and adults at: Stocksbridge Pond, Frensham (15.viii.1951, JHPS (Sankey 1952)); Oxshott (24.vii.1946, pair *in copula*, LP (Parmenter 1946)).

Choerades marginatus (Linnaeus, 1758) — **Nationally Scarce**. A widespread woodland species which is rarely seen in numbers.

Leptogaster cylindrica (De Geer, 1776). A widely distributed grassland species.

Leptogaster guttiventris Zetterstedt, 1842. Apparently very scarce, current records suggest that this species is mainly confined to western Surrey, but it is possibly overlooked amongst the more common *L. cylindrica*, so no firm conclusions can be made at the moment.

Dioctria atricapilla Meigen, 1804. A widely distributed and common species which is associated with dry grasslands.

Dioctria baumhaueri Meigen, 1820. A common species which is seemingly confined to sandy or other sites with good drainage.

Dioctria cothurnata Meigen, 1820* — ***RDB*** **3**. I am aware of just the one record: Oxshott (6.vii.1895, AB (Parmenter and Oldroyd 1940)).

Dioctria linearis (Fabricius, 1787). A woodland species whose distribution seems to be concentrated in central and south-west Surrey.

Dioctria oelandica (Linnaeus, 1758) — **Nationally Scarce**. Seemingly very scarce and confined to wooded heathland in western Surrey: Hindhead Common SU8938 (6.vi.1988, PJH); Thundry Meadows SU8943 (18.vi.1994 (Denton and Fry 1997)); Hankley Common SU8840 (1.vi.1999, GAC/RKAM); Thursley NNR SU9040 (16.vi.1985, PH), SU9140 (v–vi. 1994 (Denton and Fry 1997)).

Dioctria rufipes (De Geer, 1776). Widespread and not uncommon.

Lasiopogon cinctus (Fabricius 1781) — **Nationally Scarce**. Clearly confined to the heathlands of the Bagshot Sand and the Lower Greensand, this appears to be a good heathland indicator. My records include: Hankley Common golf course SU8742 (29.iv.1990); Wyke Common SU9152 (14.v.1994); Pirbright Common SU9556 (8.vi.1996).

CONOPIDAE

Conops ceriaeformis Meigen, 1824. Widespread but less common than *C. flavipes* and *C. quadrifasciatus*.

Conops flavipes Linnaeus, 1758. Widespread and common. Adults noted at hogweed *Heracleum sphondylium* and hemp agrimony *Eupatorium cannabinum*.

Conops quadrifasciatus De Geer, 1776. Widespread and common.

Conops strigatus Wiedemann, in Meigen, 1824 — **Nationally Scarce**. Possibly commoner than previously reported, but undoubtedly the scarcest of the genus in Surrey. Records include: near Jacobswell TQ0152 (29.vii.1994, RKAM); Winterfold Forest TQ0743 (16.viii.1987, RKAM); Esher Common TQ1362 (4.viii.1999, GAC); Eel Pie Island TQ1672 (28.viii.1985, RKAM); Ashtead Common TQ1859 (29.viii.1985, RKAM, 23.viii.1987, GAC); Headley Heath TQ1953 (18.viii.1991, RKAM); Hedgecourt TQ3540 (16.viii.1996, GAC); Staffhurst Woods TQ4148 (24.vii.1989, GAC).

Conops vesicularis Linnaeus, 1761 — **Nationally Scarce**. Figure 6. Restricted mainly to the heathlands of west Surrey and to the Winterfold Forest/Hurtwood area of the Lower Greensand. More widespread than might be expected. My records include: Tilford Reeds SU8643 (28.v.1988); Hankley Common golf course SU8742 (29.iv.1990); Westbrook, near Elstead SU8943 (28.v.1994); Puttenham Common SU9145 (13.vi.1987); Hurtwood TQ0644 (5.v.1995); Leith Hill Wood TQ1241 (4.v.1992); Friday Street TQ1245 (5.v.1989); Redlands Wood TQ1545 (5.vi.1993); Tolworth, Hogsmill River TQ2064 (10.vi.1995).

Leopoldius brevirostris (Germar, 1827) — ***RDB*** 2. Known from a single female from Sydenham Hill Wood exhibited by A. Godfrey at a BENHS indoor meeting (Godfrey 1988).

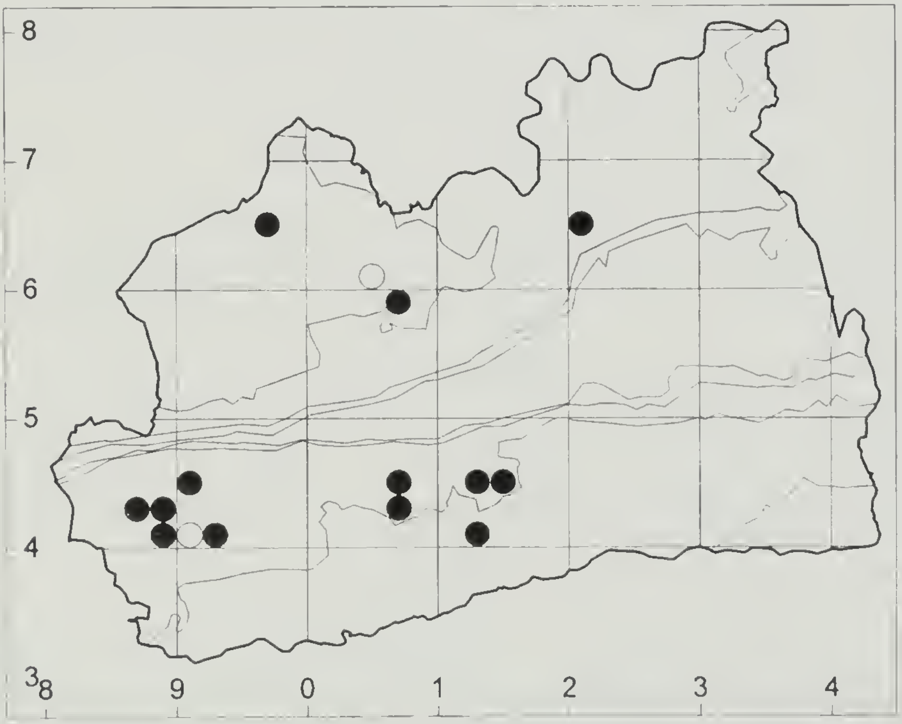

FIGURE 6. Distribution map of *Conops vesicularis* showing the high concentration of records on the Bagshot Sand and Lower Greensand.

Leopoldius signatus Wiedemann, in Meigen, 1824 — **Nationally Scarce**. Widespread in the Mitcham/Morden area (Morris 1991). Rarely seen elsewhere in Surrey, but I took a specimen at ivy *Hedera helix* by Wotton Church TQ1247 on 29.ix.1995.

Physocephala rufipes (Fabricius, 1781). Seemingly widespread. I have no records of the closely related *P. nigra* (De Geer, 1776) but believe that it should be searched for, given that it occurs on the Dorset heaths and the fauna of the Surrey heaths closely mirrors that of Dorset and Hampshire.

Myopa buccata (Linnaeus, 1758). Mainly from western Surrey, but apparently moderately common.

Myopa fasciata Meigen, 1804 — ***RDB*** **3**. Confined to the heathlands of west Surrey.

[*Myopa polystigma* Rondani, 1857* — ***RDB*** **3**. Until museum collections are checked, published records of this species need to be treated with caution as they may refer to *M. tessellatipennis*.]

Myopa tessellatipennis Motschulsky, 1859. Widespread, no obvious pattern of distribution. Recorded from sunlit *Acer* leaves at Dunsfold.

Myopa testacea (Linnaeus, 1767). Widespread, no obvious pattern of distribution, but no records are from the Chalk. Recorded from sunlit *Acer* leaves, at apple *Malus* spp. blossom and at dandelion *Taraxacum* spp. (RKAM).

Thecophora atra (Fabricius, 1775). Figure 7. Almost entirely confined to the Chalk where this species appears to be widespread and even common. There are, however, a few outlying records including one from Spencer Road Wetland TQ2866 (1.vii.–31.viii.1997, CWP). Reported as associated with *Lasioglossum morio* nests (DWB, pers. comm.).

Thecophora fulvipes (Robineau-Desvoidy, 1830) — **Nationally Scarce**. This species is much scarcer than *T. atra* and at the moment is known from just two specimens: Happy Valley, Coulsdon TQ3056 (12.vii.1999, 28.ix.1999, GAC).

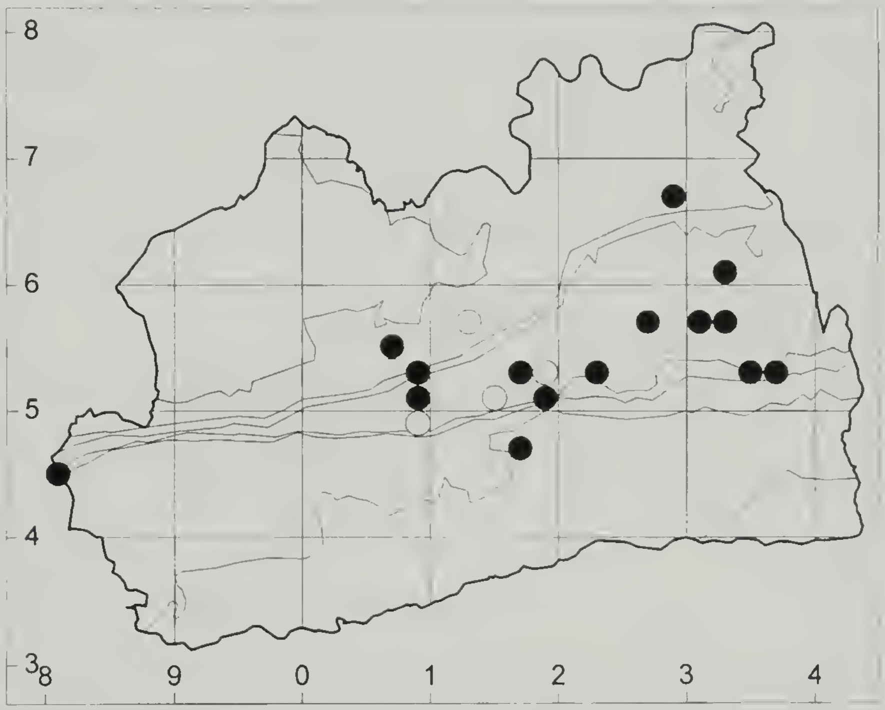

FIGURE 7. Distribution map of *Thecophora atra* showing heavy concentrations of records on the Chalk and a few outliers.

Sicus abdominalis Kröber, 1915 — ***RDB* 1.** There are just two records for this species, one from Chobham Common (2.ix.1962, AES confirmed DKC (Stubbs 1990)), the other from Mitcham Common TQ2867 (6.vii.1991, RKAM confirmed DKC).

Sicus ferrugineus (Linnaeus, 1761). An abundant species across much of Surrey, but possibly less frequent on the clays of the Weald where current records suggest it is largely absent.

Zodion notatum (Meigen, 1804)* — **Nationally Scarce.** There is a single record for the Sheepleas dated 9.vi.1968 (PJC).

Acknowledgements

I would like to thank Peter Chandler, Martin Drake, Colin Plant and Alan Stubbs for commenting on earlier versions of this manuscript, and to Martin Drake for forwarding the data held on the national recording scheme database and printouts of data compiled for the provisional atlas (Drake 1991). I would also like to thank all recorders who have contributed either directly or indirectly to this brief review.

The distribution maps in this paper have been produced using the program DMap (in its Windows version) written by Dr Alan Morton of Imperial College at Silwood Park. For further information about the program and its implementation in this case, see Morton and Collins (1992).

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Book preview

Flora of Middlesex: a supplement to 'The historical flora of Middlesex'.
Douglas H. Kent. The Ray Society. 2001.

When Duggie Kent died in September 1998 he was working on the final draft of a supplement to update his earlier work *The historical flora of Middlesex,* published by The Ray Society in 1975. This new work is due to be published in early 2001 and will be of particular interest to naturalists in London. It covers the Watsonian vice-county 21 Middlesex, effectively Greater London north of the Thames. It lists records from 1975 updated to 1999 of all the plants, mosses, liverworts and charophytes, together with their status and frequency. Since 1975, twenty-five species of vascular plants have been lost but twenty-five previously thought extinct have been found again and there are seventy-eight additional established aliens, together with 130 new casual aliens. It also contains the first accurate and detailed account of the bryophyte and charophyte floras of Middlesex. This work is being produced either as a cased set with the 1975 volume, or as a single volume, and it is intended to offer these at special concessionary prices to members of other learned societies, including the London Natural History Society.

The Ray Society, founded in 1844 and named in honour of John Ray (1627–1705), the eminent British naturalist, continues in its 156th year to publish scientific books which commercial publishers would not consider because they might not be a viable proposition, despite being of considerable scientific merit and use. Dr George Johnston, the Society's founder, had the aim of a self-financing society that would produce affordable books of high scholarly standards for British naturalists. Since its foundation the Society has published 164 books, making available works at affordable prices of value and use to British naturalists and scientists. Authors have included Charles Darwin (his work on barnacles, *A monograph of the sub-class Cirripedia* was published in two volumes in 1851 and 1854), while others continue still to be definitive works of reference today. Stephenson's monograph on *The British sea anemones* (1928 and 1935) and Berrill's *The Tunicata* (1950) still provide much useful information for contempory marine biologists.

Recent works include a revised edition of *British prosobranch molluscs, Brambles of the British Isles* and a definitive monograph of the molluscan genus *Littorina.* Not all works are necessarily on specialist subjects. *British oceanographic vessels 1800–1950* gives details of well-known ships and their scientific cruises on behalf of marine biology, such as HMS *Discovery* and HMS *Challenger,* and among the less famous the only known photograph of HMS *Porcupine,* which gave its name to the Porcupine Bank off the west coast of Ireland.

W. S. Bristowe's *The comity of spiders* (1939 and 1941) and Locket and Millidge's *British spiders* (1951 and 1953, and a third volume by Locket, Millidge and Merrett, 1974) form the foundation of the modern and flourishing study of spiders in Britain and Ireland.

Details of The Ray Society (a registered charity), together with a list of works currently available, can be obtained from the Society's Honorary Secretary, Dr N. J. Evans, c/o Department of Zoology, The Natural History Museum, London SW7 5BD.

K. H. HYATT

The London ladybird survey 1999–2000: an interim report with a note on the orange ladybird *Halyzia sedecimguttata*

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Synopsis

The organization and records from the first year of the London ladybird survey are summarized. A postscript notes recent unusual occurrences of the orange ladybird.

Introduction

The survey was initiated at the beginning of 1999. In addition to recording potentially useful data, the Ecology and Entomology Section of the London Natural History Society wished to encourage entomological recording by the wider membership of the Society and, possibly, the general public. Ladybirds are a well-known, colourful group of beetles and lend themselves to identification by the non-specialist. There have been previous successful surveys of ladybirds both nationally (Majerus 1992, Majerus et al. 1997) and regionally (Hall 1968, 1969, 1970).

The British list

Majerus and Kearns (1989) list twenty-four British species but one of these is presumed extinct and one confined to a few western estuaries; all of the others might be expected in the London Area although at least two are 'local and scarce'. Other species are occasionally found either migrating from Europe, accidentally imported from further afield, or as escapes from greenhouse biological control programmes. The European species *Henosepilachna argus* Geoffroy) seems to be established in Surrey (Menzies and Spooner 2000). Therefore at least twenty-three species might be expected from a London-wide survey.

Recording

All LNHS members were issued with a simplified key for most British ladybirds but were advised to use the handbook by Majerus and Kearns (1989) if possible. A sheet of ladybird silhouettes was also distributed to allow reporting of unusual forms or, for novices, as a simple means of reporting. Records of non-ladybird coccinellid species were not sought but any reports have been recorded. The survey was also advertised to local wildlife trusts and to other naturalists' organizations (the survey was actually adopted by the Essex Field Club). Fifty people registered although only twenty-eight submitted positive records while another three reported absence of sightings. In total 290 records were received from the LNHS recording area. None was patently unlikely but two (probably pattern variants of the 2-spot) were dubious. Figure 1 shows the distribution of records received which largely reflects the distribution of the recorders. The mode of recording was inconsistent insofar as some recorders constantly monitored single sites whereas others recorded more widely but less frequently.

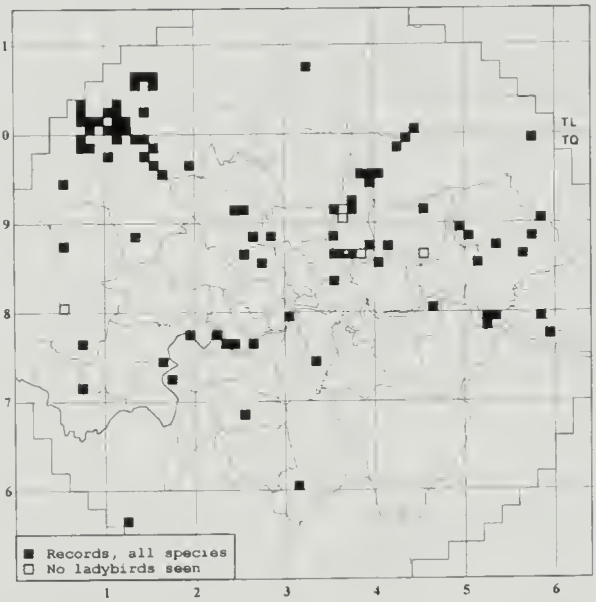

FIGURE 1. London ladybird records, 1999.

Summary of the data

For the sake of brevity, the 'common' names of species are used. The Latin names are noted in Table 1 which summarizes the records for 1999. The relatively small numbers of recorders and the patchiness of their distribution render the data so far unsuitable for analysis of distribution. Seventeen of the possible twenty-three species were reported this year along with three non-ladybird coccinellids. Table 1 shows the number of records for each species. In this context a 'record' refers to the finding of one or more specimens at a particular place and date: this is not necessarily a measure of abundance. The table also notes the maximum numbers of individuals found at any place-date. There were only two records of more than a hundred individuals. Not all recorders estimated numbers but at least 569 2-spots were noted, eight times more than the next most populous 7-spots.

Most participants agreed that 1999 was a 'bad' year for ladybirds in general. The 16-spot and 24-spot ladybirds were probably under-recorded because of their small body size and because they are found (in considerable numbers) on semi-natural grassland rather than gardens. Otherwise the most unusual figure is the dearth of 7-spots. In most years, the 7-spot would be expected to be the most numerous ladybird, especially in gardens and ruderal sites. My own records from 1994–1996 show the 7-spot as 27 per cent of all records while in 1997, from mainly cultivated sites, it contributed nearly 80 per cent of individuals. Similar analysis of 164 records from the whole of Essex show that 7-spots formed 24 per cent of records but the 2-spot only 17 per cent (Mabbott 2000). The decline in 7-spots was most notable in urban areas and there may have been a resurgence of population from August, but analysis on such small numbers is unreliable.

The occurrence of years of population outbreak is well known (e.g. Burton 1998, Majerus and Majerus 1996) but less is written about years of low abundance. The weather is most likely to be the responsible factor and while

1999 was one of the warmest years on record, there were three unusually cold weeks in mid April, early June and mid November (Hulme 1999). Coincidentally there were similar cold spells at exactly the same dates in 1998. It is possible that the cold third week of April in 1998 initiated a population decline especially as it followed a warm winter and March with ladybirds emerging early from hibernation. Both years had above average rainfall, especially in April. These spells of bad weather could cause direct mortality of all ladybird life stages and also of aphid prey. Other reasons for population decline include parasitization and disease. Geoghegan et al. (1997) have discerned high, and possibly rising, rates of parasitization of the 7-spot by the braconid *Dinocampus coccinellae* (Schrank) in Scotland. Her study is being extended and records from the LNHS scheme will be contributed. A longer time series will be necessary before any serious speculation can be made.

TABLE 1. Ladybird species reported during 1999.

Species		**Records**	**Percentage**	**Maximum**
2-spot	*Adalia bipunctata*	99	34.1	333
7-spot	*Coccinella septempunctata*	40	13.8	10
22-spot	*Psyllobora (Thea) vigintiduopunctata*	34	11.7	10
14-spot	*Propylea quattuordecimpunctata*	32	11.0	5
10-spot	*Adalia decempunctata*	21	7.2	13
Pine	*Exochomus quadripustulatus*	14	4.8	5
24-spot	*Subcoccinella vigintiquattuorpunctata*	9	3.1	1
16-spot	*Tytthaspis (Micraspis) sedecimpunctata*	8	2.8	1
Adonis	*Adonia (Hippodamia) variegata*	5	1.7	>100
Orange	*Halyzia (Halycia) sedecimguttata*	5	1.7	1
Cream-spot	*Calvia quattuordecimguttata*	4	1.4	10
18-spot	*Myrrha octodecimguttata*	4	1.4	2
Larch	*Aphidecta obliterata*	3	1.0	1
Kidney-spot	*Chilocorus renipustulatus*	3	1.0	5
Cream-streaked	*Harmonia quadripunctata*	3	1.0	3
Water	*Anisosticta novemdecimpunctata*	2	0.7	7
11-spot	*Coccinella undecimpunctata*	2	0.7	10
Eyed	*Anatis ocellata*	1	0.3	1
Hieroglyphic	*Coccinella hieroglyphica*	1	0.3	1

Nomenclature from Majerus and Kearns (1989: 3)

Postscript: unusual occurrences of the orange ladybird

The orange ladybird *Halyzia sedecimguttata* was formerly considered scarce although the national survey (Majerus et al. 1997) revealed it to be widespread and fairly numerous. It is not infrequently taken at uv traps. It is a woodland mycetophagous species, mainly eating mildew from tree foliage, and is considered to have a preference for sycamore trees (Majerus and Williams 1989) although sometimes found on oak and other trees. It is usually found in small numbers and a hundred over a site considered unusual.

On 7 March 2000, Gill and Keith Walker encountered large numbers (thousands) of a large, predominantly orange ladybird in clusters of up to a hundred on about ten beech trees near the Furze Ground, Epping Forest (TQ 4398). Ken Hill visited the site the next day and confirmed that the beetle was *Halyzia sedecimguttata*. Many of the ladybirds flew off but many small clusters, of around twenty-five individuals, remained towards the end of March. A few individuals were seen on oak trees; there are no sycamores in the immediate vicinity. The ladybirds were not found in the leaf litter, the common overwintering site, but many were in the beech mast, often clustered together within the shells. The numbers, timing and habitat of this occurrence seem remarkable. However, correspondence with Jeremy Dagley, Epping Forest Ecologist, revealed that another large aggregation ('several hundreds') had been discovered by Amanda Samuels at High Beach (TQ 4097) in March–April of 1998 and has persisted since then. This population was also on beech trees although there are sycamores at this site. Other sightings in the Forest have been in numbers below ten; usually on beech but once, in Walthamstow Forest, on oak.

Such large aggregations over small areas seem exceptional throughout the range of the species although there has been a recent report of large numbers ('mehrere hundert') from a site in Croatia (Buchsbaum 1999). It is possible that the recent mild winters have allowed survival of these populations. The sites are being monitored. Since the species flies readily, it will be interesting to see if large-scale colonization occurs outside Epping Forest.

Acknowledgements

Thanks to all those who participated during a very uninspiring year. A full list of contributors will be published in the next report. Thanks also to Keith and Gill Walker, Ken Hill and Jeremy Dagley for information on the Epping Forest orange ladybirds and to John Muggleton for information on the species. The maps were prepared with DMapW, a computer programme produced by Dr A. Morton. Colin Plant produced the parameter files for the London boroughs.

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Coleoptera: Carabidae in the London Area with a preliminary list of the ground beetles

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Summary

Records are now available to form the basis for a provisional distribution of ground beetles for the London Area but there are large gaps in the data. Difficulties are noted and a preliminary species list provided to aid conservation efforts and to stimulate further reporting. This London list includes about two thirds of the species on the national list but the data are very patchy and more records are needed.

Introduction

Invertebrate animals compose the greater part of communities in semi-natural habitats. The description of invertebrate assemblages is therefore essential in the enumeration of biodiversity and planning for conservation. Amongst invertebrates, insects are usually the most diverse and easy to identify and the Carabidae form one of the largest British families of the speciose order Coleoptera. These largely predatory beetles form a major component of the invertebrate community of litter and soil surface; they are a major contributor to the biodiversity of many types of habitat. The publication of the *Provisional atlas of the ground beetles (Coleoptera, Carabidae) of Britain* (Luff 1998) provides a baseline for study of abundance and distribution in the London Area. About 6,000 London records have been extracted from the 140,000 on the Institute of Terrestrial Ecology (ITE) database. Along with 6,000 other records these will allow production, hopefully in the near future, of a provisional distribution of carabids for the London Area. This paper notes some problems of recording and includes an interim species list to stimulate further reporting.

The national list of ground beetles

Luff (1998) lists 347 species and two species have been discovered since the publication of his atlas (Owen 1996, Levey and Pavett 1999) including a single specimen of *Harpalus griseus* at light in Wimbledon which could, hyperbolically, be described as a true 'London species'. In compiling the national list Luff excluded eight nineteenth-century records along with *Brachinus sclopeta* (F.) and known introductions such as *Carabus auratus*, although including the 'presumably introduced' *Amara cursitans* (Allen 1956). The British list includes some montane and littoral species as well as those preferring the cooler, wetter, north and west of Britain, but the majority show a preference for southern and eastern England and thus are potential inhabitants of the London Area. Some species on the list are clearly not ‘native’, including *Leistus rufomarginatus,* which has become one of the most-recorded members of its genus in the last half century.

London records

With the exception of Epping Forest, the ITE data show sparser recording north of the Thames than south. As might be expected, there are few records from the innermost boroughs; three London boroughs being entirely unrecorded. In adding to the ITE list there has been some redress of the imbalance with filling in of Hertfordshire and Buckinghamshire records along with fuller data from Greenwich, Haringey, Barnet and Waltham Forest. The accompanying maps demonstrate some problems with the records. Figure 1 shows all tetrads (4-km squares, the conventional LNHS recording unit) from which records have been obtained; the pie symbol indicates the number of species recorded from each square. Four 10-km squares (the national recording unit) have fewer than ten tetrads recorded. Most squares record few species. Most of the 552 1-km squares (monads) with records have only one or two species registered whereas only eighty squares have more than twenty-seven species (up to a maximum of 126). There are about ten ‘hotspots’ with large numbers of records and species. Although some of these are obviously centres of biodiversity it would be unsafe to conclude that other sites are ‘good’ or ‘bad’ on the basis of uneven recording.

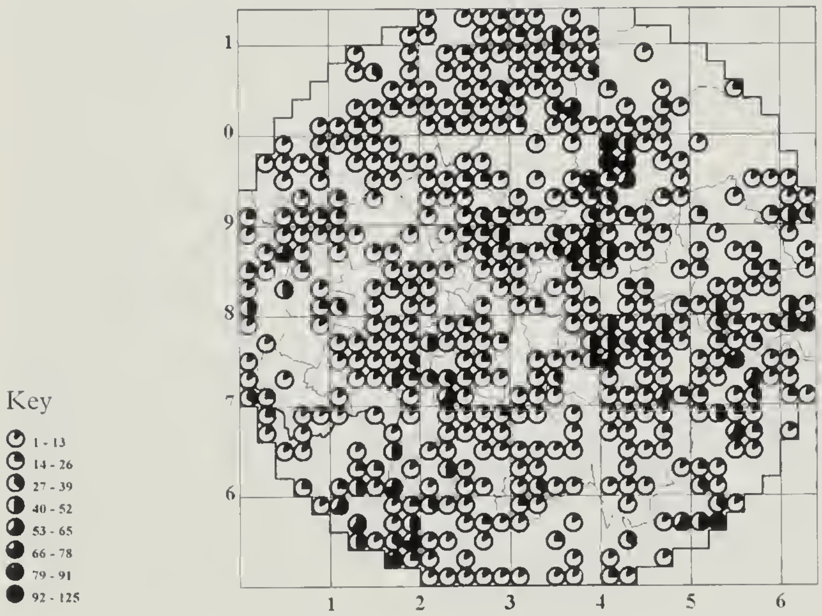

FIGURE 1. Numbers of species of Carabidae recorded per tetrad, ranging from a single species to a maximum of 126 species.

Mapping at 1-km scale further accentuates the patchiness of recording. Mapping on tetrads probably gives a better, but unproven, distribution of the more common species but exaggerates the abundance of those species which are confined to a few centimetres of pond or stream edge. There are a considerable number of old records: Figure 2, based on 1-km squares, differentiates 1970–1999 records (filled circles) from earlier, 1900–1969, ones (open); a cross indicates a square with records only before 1900. It is a truism that such maps can often represent the distribution of recorders rather than species (e.g. Rich 1998). The lack of records along the north bank of the Thames and in Lambeth and Southwark perhaps reflects the biological reality of little green space but the lacunae in some suburban and rural areas are more likely to reflect lack of recording activity. The London Boroughs of Enfield, Croydon, Brent and Harrow have few recorded monads on the map. There is a surprising paucity of records from Bromley and Ealing, as there is in rural Essex, Spelthorne and parts of north-east Surrey.

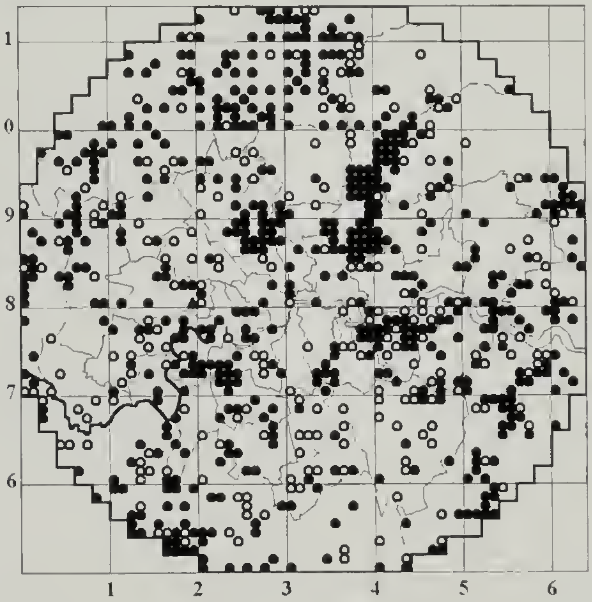

FIGURE 2. All species per 1-km square. Open circles are records pre-1970 only.

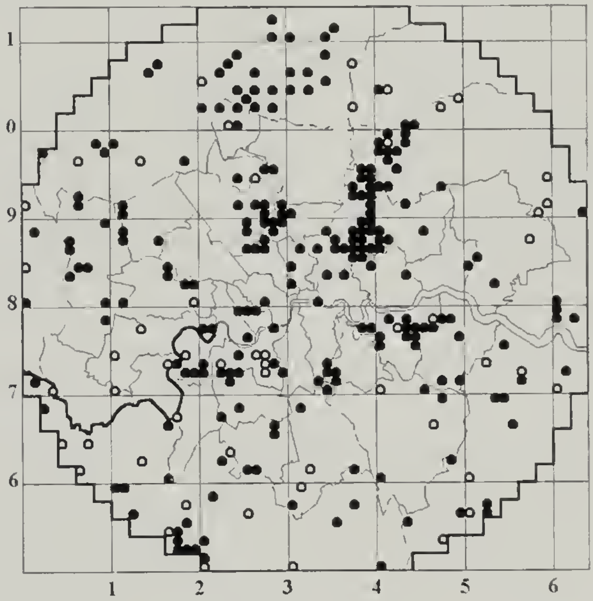

FIGURE 3. Records of either or both of the 'ubiquitous' species *Pterostichus madidus* and *Nebria brevicollis.*

One of the anomalies of biological recording is that common species are often under-recorded. Figure 3 shows the 1-km squares from which either of the two most reported species, *Nebria brevicollis* and *Pterostichus madidus*, are recorded. These are virtually ubiquitous species and should be found in a majority of our

Area's 3,426 1-km squares. In fact, *P. madidus* is recorded from only 5.5 per cent of these. This may reflect lack of recording effort or be due to selective recording by entomologists: often reports note only exceptional species and abundant ones are ignored. This is unfortunate since today's commonplace may become tomorrow's endangered species, as with the house sparrow.

There is a bias in habitats recorded. Woodland has been better sampled over recent years than other habitats and so woodland specialists are relatively over-recorded. Thus *Abax parallelepipedus*, which is largely confined to woodland in the London Area, has been recorded from 133 squares while the more abundant habitat generalist *Nebria brevicollis* has been recorded from only 18 more squares; several species of *Harpalus* (e.g. *H. affinis*) and *Amara* which are numerous on cultivated, grass and built-up land are reported from far fewer monads. The woodland *Calathus piceus* is recorded from twice as many squares as its sibling non-woodland species *C. melanocephalus* and *C. fuscipes*. Peculiarly urban habitats, such as railway sidings and water processing works, have been virtually unrecorded although interesting species were obtained, for instance, from the Temple Mills rail yard on Leyton Marsh which has now been destroyed for road building. The paucity of recording in the Lea Valley has been noted and this applies to many riverside and other wet areas where many *Bembidion* and other littoral and hydrophilic species could be anticipated.

There are other difficulties with the data. Voucher specimens or even source records are not always available, especially for the older records. This is less of a problem with recent records although occasional ones are open to doubt. For instance the possible sighting, but not capture, of a specimen of *Callistus lunatus* on Juniper Hill (Keith Alexander pers. comm.) raises doubts about its inclusion on the London list: it is included here because it is such a distinctive animal. Finally, there are problems with comparing locations and numbers of records. The precision of data ranges from e.g. 'Woolwich, before 1930' to '28 specimens, TQ431762, 18.vi.1996': clearly such records are not directly comparable. Indeed, comparison of the actual numbers of records might give a false picture of relative abundance: for instance, the Rainham Marshes have been intensively studied over recent years and the number of records of e.g. *Bembidion semipunctatum* might wrongly suggest that this is not a rare species. For comparison of species rarity, therefore, the number of 1-km squares in which the species has been recorded is used. This has drawbacks insofar as some records are for large sites. For some species it would be reasonable to attribute incidence to all grid squares covered by that site but this would give an inaccurate impression of spread for other species which are geographically confined by environmental conditions. Mapping of such records therefore, at present, is restricted to the use of mid-point grid locations.

In view of these shortcomings, it would be wasteful to produce a fully mapped provisional distribution until more data are available. Some of the problems may be overcome when more, recent and precise, records become available. However there is an immediate need amongst conservationists, managers and in local government for indicators of the London status of major invertebrate groups such as the Carabidae. It is hoped to gain access to several tranches of records over the next year or two. In the meantime, a preliminary list has been prepared as a guide to carabid diversity and abundance in the London Area. This may be useful in the formulation of biodiversity action plans and other conservation efforts.

The London list that follows contains 222 species which have been reported from the London Area between 1970 and 1999 inclusive. There are another thirty-four which have not been reported since 1969 (list 2a); many of these are probably extinct in the London Area but some may be rare species seen only sporadically and which may reappear in our Area. For instance, *Bembidion octomaculatum* had been regarded as extinct nationally until its rediscovery in

East Sussex (Jones 1992). There are four species (list 2b) which have been reported since 1970 from within two kilometres of the edge of the London Area perimeter. It is also tempting to consider the possibility of finding species such as *Microlestes minutulus* (Goeze) and *Lionychus quadrillum* (Duftschmid, 1812) which have turned up on the north coasts of Essex and Kent in recent years but these have not been listed. Three species considered to have been introduced, intentionally or by accident, are noted (list 2c). Two unlikely records of montane *Bembidion* species are noted as demanding further investigation (2d): these species are easily confused with the relatively common *B. nitidulum*. Indeed several similar species of *Bembidion* (amongst other 'difficult' genera) require comparison with reference specimens.

The provisional distribution should contain information on relative abundance (Harvey 1998, Mahon and Pearman 1993, Plant 1993) as well as distribution, phenology and habitat associations. For this interim list, as a crude measure of abundance, I have noted the number of 1-km squares from which each species has been recorded since 1969. Serious decline is indicated by marking species whose post-1969 1-km square records are one third or fewer of the number of squares recorded between 1900 and 1969, that is they are found in at least sixty-five per cent fewer sites than formerly. If the latter indicate population declines, they suggest that loss of habitat in wetland and dry grassland (especially on chalk) has been most significant, but this may also be a reflection of the woodland bias of the whole dataset. The national scarcity descriptors of Hyman and Parsons (1992) are noted. The list contains eight species threatened to varying degrees (*Red data book*: *RDB*) and fifty-five nationally scarce (Na/Nb) species. Some of the latter are relatively common regionally (e.g. *Platyderus ruficollis*). The records of the *RDB* 2 species *Polistichus connexus*, a coastal undercliff inhabitant, result from catches at light traps and raise the problem of the validity of including specimens taken in flight in lists of supposedly resident species.

Conclusion

The Carabidae is a well-described speciose family whose members are relatively easily observed and identified: their distribution and abundance should therefore be considered in all site evaluation and planning for nature conservation. A database has been formed which contributes to this but several weaknesses have been identified. Some geographic areas are under-recorded or under-reported as are certain habitat types, especially those of urban areas; species supposed to be abundant are under-reported which distorts attempts to quantify relative rarity of other species. It does not augur well for the mapping of other invertebrates in the London Area if it is not possible to achieve an accurate and reasonably complete distribution of Coleoptera: Carabidae. The author will welcome any records and specimens.

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An interim list of carabids for the London Area

The actual London list forms Part 1. This includes all species recorded since 1969. Part 2 comprises lists of 'potential' London species: (a) those which appear not to have been recorded since 1969; (b) those not yet recorded within the London Area but found close to its perimeter since 1969; (c) known introductions which have not naturalized and (d) some very dubious records.

I have used the nomenclature of Luff (1998) in which the names familiar from the common identification keys (Lindroth 1974, Forsythe 1987), *Agonum ruficorne, Bembidion unicolor* and *Harpalus aeneus* become *A. albipes, B. mannerheimi* and *H. affinis* respectively.

In addition, three species have been split: *Asaphidion flavipes* (Speight et al. 1986), *Calathus melanocephalus* (Anderson and Luff 1994) and *Pterostichus nigrita* (Luff 1990). Most of the verified specimens from the *A. flavipes* complex are *A. curtum* and it seems likely that *A. flavipes sensu stricto* is quite rare. There is, as yet, insufficient information to discriminate between the 'new' species of the *C. melanocephalus* and *P. nigrita* aggregates in the London Area. Definition of the distribution and habitat preferences of these species is important both regionally and nationally. Recent determinations of these species would be useful and I would be happy to receive specimens of *A. flavipes* and *C. melanocephalus* aggregates.

The antecedent numbers refer to the maps in Luff; the figure following the name is the number of 1-km squares with records since 1969; an arrow (↓) indicates that 1-km square incidences from 1970–1999 numbered one third or less of those from 1900–1969, i.e. there has been an apparent decline in distribution of at least sixty-five per cent; the final code is that for national scarcity (Hyman and Parsons 1992).

Part 1 — The London list

Luff	Species	1-km squares 1970–1999	Serious decline	National scarcity
2	*Cicindela campestris* Linnaeus, 1758	12		
6	*Cicindela sylvatica* Linnaeus, 1758	1	↓	Na
8	*Cychrus caraboides* Linnaeus, 1758	26		
9	*Carabus arvensis* Herbst, 1784	1	↓	
12	*Carabus granulatus* Linnaeus, 1758	7		
14	*Carabus monilis* Fabricius, 1792	3		Nb
15	*Carabus nemoralis* Mueller, 1764	46		
17	*Carabus problematicus* Herbst, 1786	15		
18	*Carabus violaceus* Linnaeus, 1758	77		
21	*Leistus ferrugineus* (Linnaeus, 1758)	49		
22	*Leistus fulvibarbis* Dejean, 1826	36		
24	*Leistus rufescens* (Fabricius, 1775)	6		
25	*Leistus rufomarginatus* (Duftschmid, 1812)	42		
26	*Leistus spinibarbis* (Fabricius, 1775)	47		
28	*Nebria brevicollis* (Fabricius, 1792)	151		
33	*Nebria salina* Fairmaire & Laboulbène, 1854	5		
35	*Notiophilus aquaticus* Linnaeus, 1758	5		
36	*Notiophilus biguttatus* (Fabricius, 1779)	120		
37	*Notiophilus germinyi* Fauvel, 1863	3		
38	*Notiophilus palustris* (Duftschmid, 1812)	19		
39	*Notiophilus quadripunctatus* Dejean, 1826	2		Nb
40	*Notiophilus rufipes* Curtis, 1829	90		
41	*Notiophilus substriatus* Waterhouse, 1833	44		
43	*Elaphrus cupreus* Duftschmid, 1812	10		
45	*Elaphrus riparius* (Linnaeus, 1758)	25		
46	*Elaphrus uliginosus* Fabricius, 1792	1		Nb
47	*Loricera pilicornis* (Fabricius, 1775)	65		
48	*Dyschirius aeneus* (Dejean, 1825)	8		
51	*Dyschirius globosus* (Herbst, 1784)	7		
53	*Dyschirius luedersi* Wagner, 1915	7		
56	*Dyschirius politus* (Dejean, 1825)	2		
57	*Dyschirius salinus* Schaum, 1843	2		
59	*Clivina collaris* (Herbst, 1784)	2	↓	
60	*Clivina fossor* (Linnaeus, 1758)	41		
64	*Patrobus atrorufus* (Stroem, 1768)	8		
70	*Trechus discus* (Fabricius, 1792)	1		Nb
72	*Trechus micros* (Herbst, 1784)	6		
73	*Trechus obtusus* Erichson, 1837	56		
74	*Trechus quadristriatus* (Schrank, 1781)	57		
77	*Trechus secalis* (Paykull, 1790)	7		
80	*Asaphidion curtum* Heyden, 1870	33		
81	*Asaphidion flavipes* (Linnaeus, 1761) ?	7		
82	*Asaphidion stierlini* Heyden, 1880	9		
83	*Bembidion aeneum* Germar, 1824	3	↓	
85	*Bembidion andreae* (Fabricius, 1787)	1		
87	*Bembidion articulatum* (Panzer, 1795)	21		
88	*Bembidion assimile* Gyllenhal, 1810	18		

90	*Bembidion biguttatum* (Fabricius, 1779)	24		
91	*Bembidion bipunctatum* (Linnaeus, 1761)	3		Nb
92	*Bembidion bruxellense* Wesmael, 1835	11		
93	*Bembidion clarki* (Dawson, 1849)	8	↓	Nb
95	*Bembidion dentellum* (Thunberg, 1787)	19		
96	*Bembidion doris* (Panzer, 1796)	7	↓	
98	*Bembidion femoratum* Sturm, 1825	10		
99	*Bembidion fluviatile* Dejean, 1831	1		Nb
100	*Bembidion fumigatum* (Duftschmid, 1812)	2	↓	Nb
101	*Bembidion genei* Kuester, 1847	17		
103	*Bembidion gilvipes* Sturm, 1825	7		Nb
104	*Bembidion guttula* (Fabricius, 1792)	40		
105	*Bembidion harpaloides* Serville, 1821	38		
107	*Bembidion iricolor* Bedel, 1879	4		
108	*Bembidion lampros* (Herbst, 1784)	73		
112	*Bembidion lunulatum* (Fourcroy, 1785)	54		
113	*Bembidion mannerheimi* Sahlberg, 1827	29		
114	*Bembidion maritimum* Stephens, 1835	1	↓	
115	*Bembidion minimum* (Fabricius, 1792)	4		
119	*Bembidion nitidulum* (Marsham, 1802)	28		
120	*Bembidion normannum* Dejean, 1831	1		
121	*Bembidion obliquum* Sturm, 1825	3		Nb
122	*Bembidion obtusum* Serville, 1821	52		
126	*Bembidion properans* (Stephens, 1828)	25		
128	*Bembidion quadrimaculatum* (Linnaeus, 1761)	36		
129	*Bembidion quadripustulatum* Serville, 1821	5		Nb
130	*Bembidion quinquestriatum* Gyllenhal, 1810	2		
131	*Bembidion saxatile* Gyllenhal, 1827	1		Nb
133	*Bembidion semipunctatum* Donovan, 1806	3		Na
134	*Bembidion stephensi* Crotch, 1871	3		
137	*Bembidion tetracolum* Say, 1823	42		
139	*Bembidion varium* (Olivier, 1795)	9		
146	*Tachys walkerianus* Sharp, 1913	1		*RDB* 1
147	*Pogonus chalceus* (Marsham, 1802)	2		
150	*Stomis pumicatus* (Panzer, 1795)	35		
153	*Pterostichus angustatus* (Duftschmid, 1812)	5		Nb
154	*Pterostichus anthracinus* (Panzer, 1795)	2		Nb
157	*Pterostichus cupreus* (Linnaeus, 1758)	40		
158	*Pterostichus diligens* (Sturm, 1824)	30		
159	*Pterostichus gracilis* (Dejean, 1828)	2		Nb
162	*Pterostichus longicollis* (Duftschmid, 1812)	6		Nb
163	*Pterostichus macer* (Marsham, 1802)	5		
164	*Pterostichus madidus* (Fabricius, 1775)	188		
165	*Pterostichus melanarius* (Illiger, 1798)	34		
166	*Pterostichus minor* (Gyllenhal, 1827)	46		
167	*Pterostichus niger* (Schaller, 1783)	33		
168	*Pterostichus nigrita* agg. (both *P. nigrita* (Paykull, 1790) and *P. rhaeticus* Heer, 1837 are recorded)	57		
169	*Pterostichus oblongopunctatus* (Fabricius, 1787)	1	↓	Nb
170	*Pterostichus strenuus* (Panzer, 1796)	86		
171	*Pterostichus vernalis* (Panzer, 1795)	32		

172	*Pterostichus versicolor* (Sturm, 1824)	7		
173	*Abax parallelepipedus* (Piller & Mitterpacher, 1783)	133		
174	*Calathus ambiguus* (Paykull, 1790)	3		Nb
177	*Calathus fuscipes* (Goeze, 1777)	46		
178	*Calathus melanocephalus* agg. (both *C. melanocephalus* (Linnaeus, 1758) and *C. cinctus* Motschulsky, 1850 are recorded)	42		
180	*Calathus mollis* (Marsham, 1802)	1		
181	*Calathus piceus* (Marsham, 1802)	85		
182	*Sphodrus leucophthalmus* (Linnaeus, 1758)	1	↓	
183	*Laemostenus complanatus* (Dejean, 1828)	2		
184	*Laemostenus terricola* (Herbst, 1784)	7		
185	*Platyderus ruficollis* (Marsham, 1802)	63		Nb
186	*Synuchus nivalis* (Panzer, 1797)	7		
187	*Olisthopus rotundatus* (Paykull, 1790)	6		
188	*Agonum albipes* (Fabricius, 1796)	76		
189	*Agonum assimile* (Paykull, 1790)	28		
190	*Agonum dorsale* (Pontoppidian, 1763)	41		
192	*Agonum fuliginosum* (Panzer, 1809)	35		
193	*Agonum gracile* Sturm, 1824	9		
195	*Agonum livens* (Gyllenhal, 1810)	1		Nb
196	*Agonum marginatum* (Linnaeus, 1758)	25		
197	*Agonum micans* Nicolai, 1822	4		
198	*Agonum moestum* (Duftschmid, 1812)	14		
199	*Agonum muelleri* (Herbst, 1784)	8		
200	*Agonum nigrum* Dejean, 1828	2		Nb
201	*Agonum obscurum* (Herbst, 1784)	48		
204	*Agonum scitulum* Dejean, 1828	1	↓	Na
205	*Agonum sexpunctatum* (Linnaeus, 1758)	1	↓	Na
206	*Agonum thoreyi* Dejean, 1828	15		
207	*Agonum versutum* Sturm, 1824	1	↓	Nb
208	*Agonum viduum* (Panzer, 1796)	7		
209	*Perigona nigriceps* (Dejean, 1831)	2		
210	*Amara aenea* (DeGeer, 1774)	67		
212	*Amara anthobia* Villa, 1833	18		
213	*Amara apricaria* (Paykull, 1790)	17		
214	*Amara aulica* (Panzer, 1796)	32		
215	*Amara bifrons* (Gyllenhal, 1810)	14		
216	*Amara communis* (Panzer, 1797)	14		
217	*Amara consularis* (Duftschmid, 1812)	1	↓	Nb
218	*Amara convexior* Stephens, 1828	19		
219	*Amara convexiuscula* (Marsham, 1802)	20		
222	*Amara equestris* (Duftschmid, 1812)	1		Nb
223	*Amara eurynota* (Panzer, 1796)	9		
225	*Amara familiaris* (Duftschmid, 1812)	51		
226	*Amara fulva* (Mueller, 1776)	2		Nb
228	*Amara infima* (Duftschmid, 1812)	1	↓	Na
230	*Amara lunicollis* Schioedte, 1837	22		
231	*Amara montivaga* Sturm, 1825	4	↓	
232	*Amara nitida* Sturm, 1825	1	↓	Na
233	*Amara ovata* (Fabricius, 1792)	20		
234	*Amara plebeja* (Gyllenhal, 1810)	28		

235	*Amara praetermissa* (Sahlberg, 1827)	1		Nb
237	*Amara similata* (Gyllenhal, 1810)	34		
238	*Amara spreta* Dejean, 1831	1		Nb
240	*Amara tibialis* (Paykull, 1798)	16		
242	*Harpalus affinis* (Schrank, 1781)	62		
243	*Harpalus anxius* (Duftschmid, 1812)	2	↓	
244	*Harpalus ardosiacus* Lutschnik, 1922	2	↓	Nb
245	*Harpalus attenuatus* Stephens, 1828	7		
246	*Harpalus azureus* (Fabricius, 1775)	5		Nb
—	*Harpalus griseus* (Panzer, 1797)	1		
252	*Harpalus latus* (Linnaeus, 1758)	16		
253	*Harpalus melancholicus* Dejean, 1829	1		*RDB* 1
254	*Harpalus melleti* Heer, 1837	6		Na
257	*Harpalus parallelus* Dejean, 1829	1		*RDB* 3
259	*Harpalus puncticeps* (Stephens, 1828)	4		
260	*Harpalus puncticollis* (Paykull, 1798)	2		*RDB* 3
262	*Harpalus rubripes* (Duftschmid, 1812)	16		
263	*Harpalus rufibarbis* (Fabricius, 1792)	30		
264	*Harpalus rufipes* (DeGeer, 1774)	69		
265	*Harpalus rufitarsis* (Duftschmid, 1812)	3		
266	*Harpalus rupicola* Sturm, 1818	1		Nb
267	*Harpalus sabulicola* (Panzer, 1796)	1		*RDB* 3
268	*Harpalus schaubergerianus* Puel, 1937	6		
271	*Harpalus smaragdinus* (Duftschmid, 1812)	1		Nb
272	*Harpalus tardus* (Panzer, 1796)	21		
275	*Anisodactylus binotatus* (Fabricius, 1787)	13		
279	*Dicheirotrichus gustavi* Crotch, 1871	3		
282	*Trichocellus placidus* (Gyllenhal, 1827)	3		
286	*Bradycellus harpalinus* (Serville, 1821)	46		
287	*Bradycellus ruficollis* (Stephens, 1828)	6		
288	*Bradycellus sharpi* Joy, 1912	14		
289	*Bradycellus verbasci* (Duftschmid, 1812)	40		
290	*Stenolophus mixtus* (Herbst, 1784)	49		
291	*Stenolophus skrimshiranus* Stephens, 1828	3		Na
292	*Stenolophus teutonus* (Schrank, 1781)	2	↓	Nb
294	*Acupalpus consputus* (Duftschmid, 1812)	9		Nb
295	*Acupalpus dorsalis* (Fabricius, 1787)	15		
296	*Acupalpus dubius* Schilsky, 1888	41		
298	*Acupalpus exiguus* Dejean, 1829	2	↓	Nb
299	*Acupalpus flavicollis* (Sturm, 1825)	5		Na
300	*Acupalpus meridianus* (Linnaeus, 1761)	26		
301	*Licinus depressus* (Paykull, 1790)	1	↓	Nb
302	*Licinus punctatulus* (Fabricius, 1792)	2		Na
304	*Badister bipustulatus* (Fabricius, 1792)	55		
305	*Badister dilatatus* Chaudoir, 1837	1		Nb
308	*Badister sodalis* (Duftschmid, 1812)	8		
309	*Badister unipustulatus* Bonelli, 1813	3		Nb
310	*Panagaeus bipustulatus* (Fabricius, 1775)	9		Nb
311	*Panagaeus cruxmajor* (Linnaeus, 1758)	1		*RDB* 1
315	*Chlaenius vestitus* (Paykull, 1790)	20		
316	*Callistus lunatus* (Fabricius, 1775)	1	↓	*RDB* 1

320	*Lebia chlorocephala* (Hoffmannsegg, 1803)	3		Nb
321	*Lebia cruxminor* (Linnaeus, 1758)	1		*RDB* 1
322	*Lebia cyanocephala* (Linnaeus, 1758)	1	↓	*RDB* 1
323	*Demetrias atricapillus* (Linnaeus, 1758)	56		
324	*Demetrias imperialis* (Germar, 1824)	16		Nb
326	*Dromius agilis* (Fabricius, 1787)	10		
327	*Dromius angustus* Brulle, 1834	7		
328	*Dromius linearis* (Olivier, 1795)	56		
329	*Dromius longiceps* Dejean, 1826	1		Na
330	*Dromius melanocephalus* Dejean, 1825	38		
331	*Dromius meridionalis* Dejean, 1825	29		
332	*Dromius notatus* Stephens, 1827	1	↓	
333	*Dromius quadrimaculatus* (Linnaeus, 1758)	45		
334	*Dromius quadrinotatus* (Zenker in Panzer, 1800)	33		
336	*Dromius sigma* (Rossi, 1790)	1		Na
338	*Microlestes maurus* (Sturm, 1827)	17		
340	*Metabletus foveatus* (Fourcroy, 1785)	41		
341	*Metabletus obscuroguttatus* (Duftschmid, 1812)	20		
342	*Metabletus truncatellus* (Linnaeus, 1761)	4		
344	*Cymindis axillaris* (Fabricius, 1794)	1		Na
347	*Polistichus connexus* (Fourcroy, 1785)	5		*RDB* 2
349	*Brachinus crepitans* (Linnaeus, 1758)	3	↓	Nb

Part 2 — Potential members of the London list

(a) Species not recorded since 1969 with the year of most recent record and national rarity status.

3	*Cicindela germanica* Linnaeus, 1758	1887	*RDB* 3
19	*Calosoma inquisitor* (Linnaeus, 1758)	1956	Na
20	*Calosoma sycophanta* (Linnaeus, 1758)	1913	
42	*Blethisa multipunctata* (Linnaeus, 1758)	1904	Nb
52	*Dyschirius impunctipennis* Dawson, 1854	1952	
61	*Broscus cephalotes* (Linnaeus, 1758)	1955	
94	*Bembidion decorum* (Zenker in Panzer, 1800)	1943	
110	*Bembidion litorale* (Olivier, 1790)	pre-1909	Nb
111	*Bembidion lunatum* (Duftschmid, 1812)	1967	Nb
123	*Bembidion octomaculatum* (Goeze, 1777)	?	*RDB*
127	*Bembidion punctulatum* Drapiez, 1821	pre-1955	
138	*Bembidion tibiale* (Duftschmid, 1812)	pre-1909	
148	*Pogonus littoralis* (Duftschmid, 1812)	pre-1909	Nb
160	*Pterostichus kugelanni* (Panzer, 1797)	pre-1970	*RDB* 1
161	*Pterostichus lepidus* (Leske, 1785)	1949	Nb
176	*Calathus erratus* (Sahlberg, 1827)	1956	
202	*Agonum piceum* (Linnaeus, 1758)	1955	
203	*Agonum quadripunctatum* (DeGeer, 1774)	1949	*RDB* 1
220	*Amara curta* Dejean, 1828	?	Nb
224	*Amara famelica* Zimmermann, 1832	1949	*RDB* 3
227	*Amara fusca* Dejean, 1828	1942	*RDB* 1
229	*Amara lucida* (Duftschmid, 1812)	1944	Nb
241	*Zabrus tenebrioides* (Goeze, 1777)	1906	Na
249	*Harpalus dimidiatus* (Rossi, 1790)	?	Na
258	*Harpalus punctatulus* (Duftschmid, 1812)	1949	Na

269	*Harpalus serripes* (Quensel in Schoenherr, 1806)	1950	Nb
277	*Anisodactylus poeciloides* (Stephens, 1828)	1952	*RDB* 3
280	*Dicheirotrichus obsoletus* (Dejean, 1829)	1957	Nb
293	*Acupalpus brunnipes* (Sturm, 1825)	pre-1900	Na
303	*Badister anomalus* (Perris, 1866)	1940	*RDB* 1
312	*Chlaenius nigricornis* (Fabricius, 1787)	1951	Nb
317	*Oodes helopioides* (Fabricius, 1792)	1910	Nb
318	*Odacantha melanura* (Linnaeus, 1767)	1873 ?	Nb
325	*Demetrias monostigma* Samouelle, 1819	1943	Nb

(b) Species found in neighbouring areas since 1969.

116	*Bembidion nigricorne* Gyllenhal, 1827	Nb
144	*Tachys parvulus* (Dejean, 1831)	*RDB* 3
249	*Harpalus dimidiatus* (Rossi, 1790)	Na
319	*Oodes helopioides* (Fabricius, 1792)	Nb

(c) Introduced species, not obviously naturalized, with year of last record.

—	*Carabus auratus* Linnaeus, 1761	1941
221	*Amara cursitans* (Zimmerman, 1832)	1953
278	*Scybalicus oblongiusculus* (Dejean, 1829)	1998

(d) Dubious records awaiting confirmation of identity and/or location.

89	*Bembidion atrocoeruleum* Stephens, 1828	pre-1970 record
135	*Bembidion stomoides* Dejean, 1831	undated record

Survey of Bookham Common

FIFTY-EIGHTH YEAR

Progress Report for 1999

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General (Ian Menzies, Chairman, Bookham Common Survey)

During 1999 the increase in rainfall seen during the latter part of 1997 and throughout 1998 has continued and the ponds and marshy areas are now fully replenished. The wet weather interrupted some of our studies, but has provided a unique opportunity to study patterns of water flow on the Common. It was noted that water draining from the huge farm field on the high ground north of Kelsey's Wood passes into a ditch that runs along the boundary of the Common and then into Kelsey's Pond. The field had been used for growing crops during the summer and was intensively treated with herbicide in the autumn. The effect of such agricultural dressings on the wild life of Kelsey's Pond and the surrounding woodland need to be considered and grazing rather than the growing of crops encouraged adjacent to areas of nature conservation.

In his report Neil Anderson observes that fish numbers in Isle of Wight Pond are again becoming excessive and possibly responsible for the poor numbers of dragonflies seen this season. He also draws attention to the extensive growth of reed mace *Typha* on the Lower Eastern Pond, which is now encroaching on the open water and competing with other flora. Indeed the *Typha* seems to have 'gone over the top' and become a threat rather than an asset, even to the dragonflies, and he advises that up to 20 per cent of the *Typha* should now be cautiously removed. Although growth of *Typha* is considered to benefit dragonflies, in particular the nymph of the somewhat local ruddy sympetrum which prefers a weedy environment, uncontrolled growth of this aggressive plant reduces biodiversity and is regarded with some apprehension by both botanist and general entomologist. The situation on Upper Eastern Pond is much the same as in the Lower Eastern Pond and a survey undertaken some five years ago for The National Trust by Julia Wycherley concluded that one third of the *Typha* should be removed. This has now become much worse and probably calls for removal of at least 50 per cent.

In the bird report it is mentioned that the nightingale 'is tending to move from woodland to scrub, a habitat which is usually given low conservation status'. The move away from woodland is interesting and may have something to do with the increasing density of tree cover following many years of relative neglect. Progressive occlusion with overshadowing of wide rides and glades, accompanied by reduction and finally loss of most ground vegetation leads to a loss of associated invertebrates which are appreciated by nightingales. The proposed reintroduction of tree thinning should help to reverse this process. Replying to this suggestion Alan Prowse states that nightingales like some light on themselves, with glades, wide rides and an increase in insects, but he also mentions that in past times (1947–51) they loved the coppiced hazel and chestnut that now get cropped by deer. Detailed knowledge of the interplay of such factors provides a sound basis for countryside management.

The decision by the BBC Science History Unit to film the purple emperor butterfly on Bookham Common during the summer was a technical challenge tackled with great success. For perhaps the first time we could share a view of these remarkable insects as they flew and battled around the treetops in Hill House Wood, seen from a BBC hydraulic platform, which featured in 'The Millennium Oak: an Island in Time'. Unfortunately our equally beautiful purple hairstreak butterfly, which has even closer links with the oak, got no publicity at all!

Management tasks on the Bookham Commons

(Ian Swinney, Warden, The National Trust)

The last year of the twentieth century has seen further improvements to the varied habitats on the Bookham Commons.

Penny Royal (or South Eastern) Pond has been carefully cleaned, retaining the gently sloping sides to support branched bur-reed *Sparganium erectum* as cover for emerging dragonflies, and a deeper centre to assist water retention in drought years. The geological structure beneath the pond turns out to be more complex than previously thought, a clay layer being revealed below a sandy surface, and then further sandy deposits below the clay. Clay was originally layered onto sand and puddled to seal the pond and protect a nearby badger's sett from flooding. Despite this the holes were found to be flooded by a general rise in the water table during recent winter months, so the badgers have headed off to higher ground! Feelings about this are mixed: while anxiety about the progressive fall in water levels has been relieved, this has been accompanied by loss of the badger, an interesting and wonderful addition to the local fauna. Crater Pond, however, an important breeding site for newts, is now brimming again.

Active management of the plains has continued with further clearance of scrub and young trees to re-establish the species-rich unimproved grassland, especially on Bayfield and Isle of Wight Plains. Some paths in this area were in danger of disappearing under the blackthorn, so selective clearance was undertaken with a view to enhancing landscape and public access while carefully retaining areas of scrub for birds such as the nightingale.

Sandy soil in combination with poor drainage on Eastern Plain generates a damp acidic heathland. This area tends to become dominated by bracken up to six feet high, which has been controlled by successive cutting, undertaken initially up to three times a year. One unexpected advantage of mowing arises from disturbance of the ground, especially obvious at turning points, which provides new sites for colonization by plants such as heather. This compensates, in a small way, for the beneficial effect of soil disturbance otherwise provided by grazing animals. However, if not removed the build-up of cut material produces a deep litter layer that may inhibit the growth of many interesting plants. Two five-metre squares have been carefully scraped back to bare soil so that, by making comparisons, the inhibitory effect of bracken litter on plant regeneration can be assessed.

Woodland work has included further restoration of the large glade at the junction of Tunnel and Woodland Paths on the boundaries of Central and Eastern Woods. A shrubby margin will now be allowed to regenerate from the scalloped boundary, and growth of bramble and other ground vegetation, important sources of nectar and host-plants for woodland butterflies and other invertebrates, encouraged in the centre.

Unfortunately Dutch elm disease has again killed off most of the larger English elm, and also wych elm, although the latter is considered less susceptible. It is hoped that vegetative regrowth from suckers generated from the roots of parent trees will progress rapidly for the sake of the white-letter hairstreak butterfly.

Once again The National Trust would like to take the opportunity of thanking the London Natural History Society for continuing to provide detailed information which forms a vital basis for nature conservation on the Commons.

Vegetation — a remarkable increase (Ken Page)

Adoxa moschatellina moschatel has always been rare on Bookham Common and restricted to the northern Divisions A, B and C. It had disappeared from A before the last survey and had more recently been discovered in C, but had always been found in B in a limited area. The area has now become extensive. Moschatel is a perennial rhizomatous plant flowering in early spring before deciduous trees begin to leaf. The yellowish-green foliage and flowers, a few inches high, grow in lawn-like patches that make it uniquely recognizable. But what has brought about its dramatic increase? It may be the relatively mild winters in recent years, giving the plant a longer growing season. Its flowering period is said to be April and May, but locally, flowering has beeen observed at the beginning of March. It would be interesting to hear other views on this phenomenon.

Viola reichenbachiana pale wood violet, in the same division, has similarly increased its spread and numbers, though the flowering time appears to be normal.

Pulmonaria mollis was first found in Division D a few years ago. This is a difficult genus with a complex of closely related taxa. Botanically our plant appears to possess the appropriate characters for this species. The leaves are *softly* hairy, not hispid as in many of the species, and the ultimate colour of the flowers is purplish, not blue. It blooms earlier than *P. officinalis* and has a long flowering season. A piece of the plant that I have grown in my garden is vigorous and highly fertile — many self-sown progeny have appeared.

Chionodoxa luciliae glory-of-the-snow, found in the car park near Mark Oak in Division C, confuses many botanists. Most of the plants found in Surrey belong to the closely related species *C. forbesii* which has up to twelve bright blue flowers per stem, whereas the stem of *C. luciliae* has only two or three pale blue flowers.

Birds (Alan D. Prowse)

A kingfisher in the early days of January started the year well. In February a water rail was seen in the marsh near the Isle of Wight Pond. Single hawfinches were recorded on only two occasions on Central Plain in the late winter. A territory-holding little grebe was present from 22 March to 10 April. Mandarin ducks were present, as usual in the area, and a pair of tufted ducks visited on 17 April. A pair of sparrowhawks displayed over the woodland in late March, and another pair was in display over Western Plain on 30 April. A pair of kestrels was in courtship flight over Central Plain and neighbouring part of Bookham on 29 March though there was no further evidence of breeding. Stock doves increased to five known pairs and this was a real increase since the additional ones were in well-covered areas.

There were five territories of green woodpecker on the Plains, and at least ten were known on the Common. The only record of lesser spotted woodpecker was at Pond 3 on 12 May. Nightingales and song thrushes had a good year. On 22 March a redwing was in full song on the Isle of Wight Plain, and flew off with a second bird with alarm calls. It continued its alarms on landing. Dreams that it might stay were not fulfilled.

It was an early year for migrants, with the first blackcap on 29 March, and the first nightingale on 6 April. Lesser whitethroats were present from 30 April to 12 May with four birds singing on 5 May; one persisted for eight days, but none bred.

Roger Suckling reported ten successful heron's nests. This total is much lower than in recent years. It is known at the time of writing that there were record numbers of nests and successful nests in 2000, so the cause(s) must have been temporary.

The Ponds

There were very few, if any, successful broods on the Ponds this year. One small brood of mallard ducklings was seen but did not survive. At Effingham Fish Ponds broods of several species of ducks and grebes disappeared, and five mink were controlled. In a local paper in July there was an article on mink destroying the birds on the River Mole in Leatherhead. I have little doubt that the lack of success on the Ponds this year had the same cause.

Population studies

TREECREEPER. In Prowse (1998) it was suggested that this species was under-recorded, and that a reliable method of censusing was unknown to the author.

In 1999 there were eight known pairs in the study areas S, T and M, giving a density of 33.6 pairs per sq. km. in woodland, and there were two pairs on the Plains. In 1998 there were five known pairs in E and the wooded parts of D giving a density of 33.3 pairs per sq. km.

It is a strong impression from field work that the species occurs in similar density through the wooded areas. Extrapolation from these remarkably similar densities gives a population for the woodland of about 37 pairs, and there are two pairs on the Plains. The population of treecreepers on the Common is, therefore, probably in the range of 30 to 50 pairs.

NUTHATCH. A similar exercise gave five population figures for the woodland between 23 and 29 pairs (and one of 19.5 from a more open area); with one pair on the Plains. This gives a probable range of 20 to 35 pairs.

DUNNOCK. In 1999 there were 46 territories on the Plains, (and at least fifteen pairs known in other areas in the survey of 1997), so a population range of 50–100 is probable.

OTHERS. Jay: 25–50, magpie: 15–25, carrion crow: 15–25, great spotted woodpecker: 25–50.

Notes on other species

SONG THRUSH. On the Plains in 1999 there were 13 territories, with 17 for blackbird. There appears to be a slight recovery in song thrush numbers since 1997, and numbers are similar to those recorded in the 1940s on the Plains.

TURTLE DOVE. This is an elusive species. It has a late and long breeding season, but Callardine et al. (1999) find that after 1 June surveys fail to find 70 per cent of the population unless conducted before 05.00 hours! In 1999 song or display were recorded in 12 distinct areas and this is thought to be the population level, a marked recovery from the previous year. Two other pairs were known near the Common.

NIGHTINGALE. In 1999 there was a national census of the species by the British Trust for Ornithology (BTO). There were 11 pairs on Bookham Common (a record) and a twelfth singing male was recorded with a late territory in early June. There were 77 singing males recorded in Surrey so our population at Bookham is a significant one. Kent is the county with the largest population, and the species is tending to move from woodland to scrub, a habitat which is usually given low conservation status. The conservation of the species in scrub is therefore of some importance, and a paper is in preparation on the conservation of the species in scrub at Bookham (Prowse in prep.).

TABLE 1. Territories of selected migrants on Plains of Bookham Common.

Species	**Territories** 1997	1998	1999	**Change %** 1998–9	**CES Change %** 1998–9 (adult)
Turtle dove	14	5	12	+140	
Nightingale	8	7	11	+57	
Whitethroat	28	35	33	–6	–7
Garden warbler	14	19	24	+26	–5
Blackcap	12	27	23	–15	0
Chiffchaff	7	10	10	0	–42
Willow warbler	36	29	26	–10	–6

As in the last report the percentage changes for these species on Bookham Common are compared in the final column with the Constant Effort Site (CES) ringing results of the BTO which reflect changes in the national populations.

Garden warbler numbers rose against the national figure while its close relative the blackcap fell. This reflects the habitat changes on the Plains as the standard oaks and other trees have been removed. Nevertheless, the chiffchaff, a lover of light woodland with understorey, maintained its numbers against the national trend, although the willow warbler continued its decline, especially in the newly established grazing areas of Bayfield and Isle of Wight Plains.

Acknowledgements

My thanks are due to those who submitted records during the year: R. Kettle, C. Pettigrew, R. Suckling and Ian Swinney.

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Dragonflies (Neil Anderson)

Two visits were conducted during the year to search for Odonata, on 10 July and 21 August. The first was hot and sunny, whilst the latter began cool but became warm and sunny with some cloud cover and a light north-west wind.

Numbers of Odonata on the earlier date were surprisingly low given the ideal weather which had continued for a few days. Though numbers were low, most of the expected species were recorded. Only two anisopterans were found on the Isle of Wight Pond: one brown hawker *Aeshna grandis* and a male black-tailed skimmer *Orthetrum cancellatum*. Zygopterans fared better with over thirty common blue damselflies *Enallagma cyathigerum*, several blue-tailed damselflies *Ischnura elegans* and three male banded demoiselles *Calopteryx splendens* present. The August visit was not much more productive at this large pond, with only one migrant hawker *A. mixta*, a female *A. grandis* ovipositing in cut wood below some *Salix*, one common darter *Sympetrum striolatum* and a handful of *E. cyathigerum* and *I. elegans*. On this latter date the water was observed to be turbid with one large fish leaping out of the water and numerous fry seen at the water's edge. Despite being cleared a couple of years ago, there are obviously quite a few fish present which may be a factor in the apparently low numbers of Odonata recorded.

In July emperor dragonflies *Anax imperator* were found on Western Hollows, Lower Eastern and Bayfield Ponds (one on each). Two male broad-bodied chasers *Libellula depressa* were spotted, one on Bayfield and the other on Western Hollows. Bayfield Pond also yielded one *Aeshna grandis* and two male southern hawkers *Aeshna cyanea*. Lower Eastern Pond was productive, with a well-coloured male ruddy darter *Sympetrum sanguineum*, a large red damselfly *Pyrrhosoma nymphula*, several azure damselflies *Coenagrion puella* and three emerald damselflies *Lestes sponsa*, including a copulating pair.

The August visit did follow a week with cool temperatures and some exceptionally heavy rain which may account for the disappointingly low numbers of Odonata recorded. Small numbers of *Sympetrum striolatum* and *S. sanguineum* were recorded from most ponds. More of the former were encountered along woodland rides — many tenerals feeding up, individuals which may have emerged subsequent to the heavy rains earlier in the week. The woodland rides were also very productive for patrolling *Aeshna cyanea* with four counted between Merritt's Cottage and Kelsey's Pond. Bayfield Pond was also good for this species with three solitary males as well as a pair flying in cop. near the tree tops.

As I was abroad for a large part of September, no further visits ensued and I was thus unable to see if the populations of 'late' species such as *Sympetrum striolatum* and *Aeshna mixta* picked up.

In terms of management the potential fish problem on the Isle of Wight Pond should be investigated. Open water on Lower Eastern Pond is now limited with the extensive *Typha latifolia* taking over and competing out other flora. *Typha* is important for the *Sympetrum sanguineum* population so removal of some *Typha* (no more than 20 per cent) should be undertaken sensitively. This should improve the biodiversity of the pond as some invertebrates are now decreasing or disappearing as their foodplants are excluded by the *Typha*.

Finally, due to other commitments and the fact that Bookham is not local to me, I do not get there as often as would be ideal. It would therefore be very useful if I could receive records of numbers and species of Odonata from any visiting naturalists to provide a fuller picture.

Study Day report, 10 July 1999 (Neil Anderson)

About a dozen people attended this gloriously hot and sunny day. It was good to have a school child amongst the attendees who was mad on bugs.

The chain of ponds running east from the Isle of Wight Pond were examined for Odonata on the wing, basking on bare substrate or amongst the surrounding vegetation. As described in the Odonata report, population levels appeared to be low, though the range of expected species was encountered, with their diagnostic features and habits explained. Whilst scanning the Lower Eastern Pond, I was very fortunate to spot a female purple emperor *Apatura iris*, investigating and disappearing into sallows *Salix*, where she was no doubt ovipositing. Eventually most of the party succeeded in watching this splendid insect. I later took the party to a display site where we watched at least two males regularly gliding from the tree tops.

Good numbers of white admiral *Ladoga camilla*, and silver-washed fritillary *Argynnis paphia*, were seen. This latter species now appears to have made a full re-establishment at Bookham. No white-letter hairstreaks *Strymonidia w-album* could be found, and only one purple hairstreak *Quercusia quercus* was seen well. In total sixteen species of butterfly were located. Not a single small tortoiseshell *Aglais urticae* was seen.

Dr Ian Menzies pointed out various Coleoptera, including the iridescent water-mint beetles *Chrysolina menthastri* and *C. polita*. Also admired were a couple of nymphs of speckled bush cricket *Leptophyes punctatissima* by Isle of Wight Pond. Overall a productive day.

Butterflies and moths (Ken Willmott)

A second successive cool and largely sunless spring resulted in the all too familiar problems for butterflies — finding flight weather to nectar for nutrition, time to court and mate and the time to deposit as many eggs as possible on their relevant foodplants. Good years for certain butterfly species often follow good slots of weather during their flight periods, thus allowing a high percentage of their eggs to be laid.

Short fine spells in the middle of March saw several brimstones *Gonepteryx rhamni* on the wing (I. Menzies) and again at the end of the month, heralding the first orange-tips *Anthocharis cardamines* on 2 April. Three were seen on this date. Five days later fresh holly blues *Celastrina argiolus* and a fine male large white *Pieris brassicae* were also encountered on the Common.

Thursday 8 April was the perfect day for egglaying small tortoiseshells *Aglais urticae* — bright and with little or no wind. Two were seen depositing their large batches of eggs on the underside of the terminal leaves of stinging nettle *Urtica dioica*. Days with wind make it difficult for small tortoiseshells to sit at the top of nettle plants for 30+ minutes carefully laying a batch of shiny green eggs. They often select smaller sheltered plants in 'holes' within the nettle bed surrounded by taller nettles to prevent them being swayed about by the wind.

Six speckled woods *Pararge aegeria* were also on the wing on 8 April, having hatched from overwintering pupae. This is the only British species to spend the winter in either of two different stages — larva or pupa — the former overwintering stage hatching in May and often flying with old specimens that had overwintered as pupae. A single orange underwing *Brephos parthenias* was also seen flying on this fine day.

Seven weeks after the first orange-tips were seen, three were still flying on 23 May. Their bright orange eggs were also located on the flower stalks and unopened bud sheaths of dame's violet *Hesperis matronalis*, an interesting member of the Cruciferae family whose many species play host to the larvae of this harbinger of spring. Orange-tips, like other spring butterflies, live longer during cool weather as they spend much of their time resting when temperatures are lower and skies cloudy, thus preserving their energy resources, resulting in a lengthened life span. This, however, must be dependent on some prolonged periods of nectaring at flowers to obtain the necessary supply of nutrients.

Two small coppers *Lycaena phlaeas* were also seen on 23 May, but searches for small tortoiseshell larval batches were very disappointing, only a single batch of second instar larvae being located, together with a single larva, much older and in its penultimate instar. Both 'old' and 'new' speckled woods were cavorting in the shady rides.

A month later, on 24 June, the first purple emperor *Apatura iris* was seen on its annual territory. Because this species is highly visible on Bookham Common one can easily ascertain its flight period, during spells of fine weather, and it has been interesting in recent years to record its appearance on or around Midsummer Day. A couple of white admirals *Ladoga camilla* were also seen on this day, together with two red admirals *Vanessa atalanta* and several commas *Polygonia c-album*. A final instar larva of the comma was also located on this date and the adults were of the pale *hutchinsoni* form, from the first dozen or so eggs laid by a female in the early spring. The larva should turn out to be the dark overwintering form that does not mature and pupate before Midsummer's Day.

A female speckled wood was seen depositing eggs and over fifty meadow browns *Maniola jurtina* were seen flying in Banks Meadow, but only one female appeared to be on the wing amongst a daily increasing population on this date. The ringlet *Aphantopus hyperantus* was also beginning to emerge on 24 June and at least ten different males were observed.

On 25 June I had the largest count of white admirals for the 1999 summer, a total of approximately fifteen individuals, well scattered throughout the Common. Low numbers reflected a second successive poor spring. Probably the same male purple emperor adorned the tallest trees in its annual territory as the day before.

On the last day of June I searched almost in vain for white-letter hairstreak *Strymonidia w-album*. The ravages of Dutch elm disease on the Common relentlessly progress, each year seeing another favoured spot for white-letter hairstreak succumb. A single specimen was seen however, plus a couple of silver-washed fritillaries *Argynnis paphia* and over forty ringlets, a species noted for doing well in cool wet summers, possibly as a result of lush grass growth?

The new brood of small tortoiseshells were flying over regrowing nettle beds on 3 July and purple hairstreaks *Quercusia quercus* were seen around the high branches of an oak. Two new generation commas were also busy locating nettle plants and depositing eggs.

On 5 and 6 July three purple emperors were seen on their territory and red admirals sparred in their territory at a lower elevation, but in the same 'canopy gap'. Only half a dozen white admirals were seen and a batch of small tortoiseshell eggs located. Small skipper *Thymelicus sylvestris*, poor in numbers in 1998, was showing better on these dates, over twenty individuals being recorded. The best count of white-letter hairstreaks was also made on the same days — a total of six. This compares with the uncountable numbers to be seen flying around most healthy elms five years ago. Silver-washed fritillary was up in numbers, but still lower than two years ago when it was widespread throughout the Common. Four on one bramble patch — a promising observation made on this date — was the prelude to a maximum 1999 count of fifteen, mostly males, a week later on 11 July.

By 8 July small skipper numbers had doubled and a fine batch of peacock *Inachis io* larvae found, one of relatively few located on the Common during 1999. A comma was seen depositing eggs on wild hop *Humulus lupulus*. A single marbled white *Melanargia galathea* was seen, almost an annual event on the Common in recent years. A pair of ringlets in cop. was also observed.

A second generation holly blue *Celastrina argiolus* was seen on 11 July — a very mediocre season nationally for this species which has violently fluctuating populations, especially away from core breeding areas where there are high densities of larval foodplant available for egglaying females. Ten white admirals were scattered about the Common, and eight days later, 19 July, it was pleasing to find a dozen first instar larvae on the shady honeysuckle *Lonicera periclymenum* without too much searching, suggesting that the small number of adults during 1999 at least had a weather slot to lay a fair percentage of their egg totals.

On 3 August several common blues *Polyommatus icarus* were seen on Eastern Plain (I.Menzies) and a fine final instar larva of the emperor moth *Saturnia pavonia* was found marching, *en route* to pupation, along Common Road near Merrit's Cottage by the NT Warden Ian Swinney. Earlier in the year an empty cocoon of this species was found at the south end of Glade Path (I. Menzies).

Butterflies had mixed fortunes on Bookham Common during 1999. Fewer white admirals and silver-washed fritillaries, more skippers and no brown argus or grizzled skippers reported. A fine spring and summer 2000 is much needed.

Beetles (Ian Menzies and Maxwell Barclay)

The staphylinids *Philonthus spinipes* and *Trichiusa immigrata*, and the cryptophagid *Atomaria punctithorax* are all recent additions to the UK list, *P. spinipes* being new to Surrey. Species such as *Oxylaemus variolosus* (RD3/AW2) and *Rhizophagus oblongicollis* (RD1/AW1), previously regarded as extreme rarities, are turning out to be more widespread with the increased use of specialized techniques such as subterranean pitfall trapping.

The histerid *Plegaderus dissectus* (Nb/AW2) was found under the bark of logs in the Arboretum (14.viii.1999, RB) and, a further three examples, by Merritt's Cottage (31.viii.1999, MB/JM/MC). *Leptusa pulchella* and *Euplectus infirmus*, were also found under bark on logs (14.viii.1999, RB). *Platystomos albinus*, a striking grey and white fungus weevil which appears to be spreading rapidly in Surrey and Berkshire in recent years, was discovered resting on ash palings used to label tree species in the arboretum (1.v.1999, SP/MB).

The bark beetle *Xylocleptes bispinus* was discovered in the nodes and dying stems of old man's beard *Clematis vitalba* in the Tunnel car park (1.v.1999, AC), and *Apion modestum*, a widespread but under recorded seed weevil was beaten from *Lotus uliginosus* by Isle of Wight Pond (31.viii.1999, IM et al.).

Table 1. New species of Coleoptera recorded for Bookham Common during 1999.

Species	Date	Location and status	Found by
Histeridae			
Plegaderus dissectus Erichson	14.viii.1999	Under bark, Arboretum. Nb/AW2	RB
	31.viii.1999	× 3 under bark of dry logs, near Merritt's Cottage	MB/JM/MC
Staphylinidae			
Philonthus spinipes Sharp.	27.x.1999	Five in horse dung at west margin of Bayfield Plain	IM
Quedius lateralis (Gravenhorst)	1.v.1999	Under stones and logs near Merritt's Cottage	MB
Quedius schatzmayeri Gridelli	13.ii.1999	In horse dung, west margin of Bayfield Plain	RB
Leptusa pulchella (Mannerheim)	14.viii.1999	Under bark, Arboretum.	RB
Oxypoda sericea Heer	13.ii.1999	In horse dung, west margin of Bayfield Plain	RB
Trichiusa immigrata Lohse	13.ii.1999	In horse dung, west margin of Bayfield Plain	RB
Pselaphidae			
Euplectus infirmus Raffray	14.viii.1999	Under bark, Arboretum.	RB
Rhizophagidae			
Rhizophagus ferrugineus (Paykull)	28.iii.1999	16 in deep pitfall trap by dead oak, Glade Path	IM
Rhizophagus oblongicollis B. & H.	5 & 28.iii.1999	Deep pitfall trap by dead oak, Glade Path. RD1/AW1	IM
Cryptophagidae			
Atomaria punctithorax Reitter	13.ii.1999	In horse dung at west margin of Bayfield Plain	RB
Erotylidae			
Dacne bipustulata (Thunberg)	14.iii.1999	By sieving litter under dead oak, Glade Path	MB/JM
Coccinellidae			
Scymnus suturalis Thunberg	1.v.1999	By sweeping reeds	MB
Colydiidae			
Oxylaemus variolosus (Dufour)	29.xii.1999	In deep pitfall trap by Hollows Path. RD3/AW2	IM
Anthribidae			
Platystomos albinus (Linnaeus)	1.v.1999	On ash paling in arboretum. Nb/AW3	SP/MB
Apionidae			
Apion modestum Germar	31.viii.1999	Swept from *Lotus uliginosus*, by IoW Pond	IM
Curculionidae			
Xylocleptes bispinus Duftschmid	1.v.1999	In dead *Clematis* by Tunnel car park	AC

Some further records of notable beetles at Bookham

Tetratoma desmaresti Latreille (Na/AW3) was rediscovered on 14 March 1999 when three specimens were obtained by sieving leaf litter under a dead fungus-ridden oak by the south end of Glade Path (MB and JM). Apparently the last Surrey record was a specimen 'from fungoid oak' taken by Dr A. M. Easton at Bookham in the 1940s.

On 31 March 1999 several specimens of the very rare ladybird *Clitostethus arcuatus* (Rossi) were beaten from honeysuckle *Lonicera periclymenum* growing around a birch tree in a shady wood margin at the border of Eastern Plain, by Matthew Hogg. This RD1 insect, a predator on various whitefly species, is a speciality of Bookham Common. It has generally been found on ivy, but is also recorded from *Viburnum tinus* which, like *Lonicera* belongs to the Caprifoliaceae.

Xyleborus dispar (Fabricius), last recorded on the Commons in 1930, was rediscovered (1.v.1999, AC), and the leaf-rolling weevil *Attelabus nitens* (Scopoli) that feeds on oak, considered a common species in the 1940s by Dr Easton, has also been noted at Bookham again this year (8.v.1999, IM) after a long period without records.

An unexpected discovery was made recently when a ground-beetle found running on mud by Eastern Hollows Pond (31.vii.1997., IM) was re-examined at The Natural History Museum, South Kensington. At first thought to be *Tachys micros* (Fischer von Waldheim), this carabid was finally confirmed as *Paratachys pallidulus* (Antoine). We are grateful to Peter M. Hammond for making this difficult identification, which is of great interest as the species is not only new to the UK but has a natural distribution in North Africa (Morocco, Algeria) and southern Spain!

Key:

Status	Nb = Notable B or Local	RD3	Rare	AW1 Ancient
	Na = Notable A or Very Local	RD2	Rare; Vulnerable	AW2 woodland
		RD1	Very Rare; Endangered	AW3 categories

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Bush-crickets and grasshoppers Field Day, 14 August 1999

(Ian Menzies)

Fortunately the morning weather was fine, and there was a good attendance. Roesel's bush-cricket *Metrioptera roeselii* was present in numbers on Bayfield Plain, but scarce elsewhere. Though the long-winged conehead *Conocephalus discolor* was abundant in most of the grassy areas, the short-winged conehead *Conocephalus dorsalis* could not, for the second year running, be detected on the Common. Both dark and speckled bush-crickets *Pholidoptera griseoaptera* and *Leptophyes punctatissima* were also seen, but none of the usually plentiful oak bush-cricket *Meconema thalassina* could be dislodged for inspection by beating.

Of the 'shorthorns' the meadow grasshopper *Chorthippus parallelus* was, as usual, the most abundant and widely distributed. Small colonies of field and common green grasshoppers *Chorthippus brunneus* and *Omocestus viridulus* were seen on Bayfield and Western Plains, but were by no means abundant. It is strange that the lesser marsh grasshopper *Chorthippus albomarginatus* has never been recorded from Bookham, despite the boggy ecology and distribution of the species along the Thames Estuary.

The clouds thickened at tea time, and those of us who braved the thunder, lightning and torrential downpour *en route* to Wisley Common (TQ 068589) were eventually rewarded with sunshine and the sound of bog bush-crickets *Metrioptera brachyptera* stridulating amongst the heather. A thriving colony of short-winged coneheads *Conocephalus dorsalis* was studied in rushes around the ponds, and wood-crickets *Nemobius sylvestris* observed as they skipped amongst dry leaves at the wood margins. Roesel's bush-cricket, previously scarce amongst the heather at Wisley, was heard stridulating in quite large numbers this year. A brief second stop at Fairmile Common (TQ 116616) enabled us to complete the day by seeing the mottled grasshopper *Myrmeleotettix maculatus* in large numbers on sandy areas amongst the heather, but we failed to detect any stripe-winged grasshoppers *Stenobothrus lineatus*, also known to occur at Fairmile.

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Hampstead Heath Survey

Progress Report for 1999

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General (Colin Bowlt, Chairman)

The status or, as it has been quaintly referred to, the citizenship, of a species at a site is sometimes difficult to decide, and indeed may change (e.g. a casual can become established to be ranked as an alien). The whole business can get horribly complicated and is well discussed by McClintock (1966) in his book which is full of good things. One of the troubles the Heath Survey has is in trying to sort out the citizenship of a host of non-native plants that are present, and which also keep appearing. Some species can easily be classified, e.g. daffodils, but others are more difficult. For instance, ling *Calluna vulgaris* is known to have been present on the Heath from earliest times but has gradually declined. Replanting has been going on for a number of years as is described further on in this report by Richard Payne. How does one distinguish between replantings (and progeny), and any remaining, relict ling? Does it matter? Well, scientifically it would be nice to know. Genetic differences might cause the plants to behave differently.

New plants arrive on the Heath in several ways. There are those that just appear as part of a natural geographical spread of the species, such as that of Guernsey fleabane *Conyza sumatrensis* or the moss *Ulota phyllantha*, which is mostly recorded near coasts but turned up in 1991. Then there are plants that are reintroduced officially by the Corporation of London as part of their conservation programme, such as ling, mentioned above, and bog myrtle *Myrica gale*. More insidious is the possible inadvertent introduction of other species at the same time. For instance, dodder *Cuscuta epithymum* was apparently accidentally introduced along with ling. In addition there are the surreptitious introductions by members of the public, of what are, usually, garden throw-outs. This is presumably the origin of, for instance, meadow cranesbill *Geranium pratense* and dusky cranesbill *G. phaeum* on Sandy Heath, but we should not assume that all the 'private conservation' will be as obvious.

Finally, a related matter is that of introductions which are positively harmful to conservation. The prime example on the Heath (and many other places) is that of the Spanish bluebell *Hyacinthoides hispanica* as shown by Tony Vaughan in this report. This is a vigorous garden plant which apparently hybridizes with the English bluebell *H. non-scripta* and seems ultimately to lead to the disappearance of the native species. Many people seem not to realize that their garden bluebells are a different species and plant their surplus in open spaces. Much London woodland seems now to have only hybrids and it is difficult to see how this can be altered. There is a lesson here for other woodlands which still retain their English bluebells.

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Bluebells *Hyacinthoides* spp. on Hampstead Heath

(Anthony Vaughan)

Introduction

The wild bluebell *Hyacinthoides non-scripta* is one of Britain's best-loved plants. It is probably commoner in Britain than anywhere else in the world and it has been adopted by the Botanical Society of the British Isles as its logo. In gardens, however, the preference in the twentieth century was to grow a closely related plant, the Spanish bluebell *Hyacinthoides hispanica.* The Spanish bluebell sets seed in Britain, reproducing itself both inside gardens and in suitable habitats outside. In recent years Stace (1997) and others have noted that many plants both in gardens and in the wild appear to be hybrids between these two species. In northern Spain, where the natural range of the two taxa meet, there exists a zone of hybridization and there is no doubt that in Britain many naturalized bluebells in urban and suburban areas are in fact intermediate between the two species. Sell and Murrell (1997: 268) state that the hybrid is 'fertile and forms a complete spectrum between the two parents and is often found in the absence of both'. Sell and Murrell name the hybrid *Hyacinthoides* × *variabilis* P.D. Sell, but a recent note states that the correct name for the hybrid is *Hyacinthoides* × *massartiana* Geerinck (Clement 2000).

In spring 1999 an attempt was made to survey the bluebells growing on parts of Hampstead Heath. Members of the survey team visited every part of the Heath and found bluebells almost throughout. It became clear that bluebells, though not always particularly abundant, were one of the Heath's most widespread plants.

However, 'bluebell' could mean one of three different taxa: the wild bluebell, the Spanish bluebell, or the variable hybrid between the two. In an attempt to discover which of the three taxa were present on the Heath, a more detailed study was made in sixty-three of the hundred or so compartments into which the Heath has been divided by some members of the survey team. Included in these compartments were Parliament Hill Fields, Hampstead Heath Extension, and parts of Kenwood, the East Heath and the Sandy Heath.

To determine the species, the fairly detailed descriptions in Sell and Murrell (1997: 268) were used, as well as the key in *Plant Crib 1998* (Rich and Jermy 1998: 374). Plants were coded either as the wild bluebell *Hyacinthoides non-scripta,* as the Spanish bluebell *Hyacinthoides hispanica* or as the hybrid between the two. As the hybrid forms 'a complete spectrum between the two parents', it was sometimes difficult to allocate a particular plant to one of the three categories used.

Results

Bluebells were found in forty of the sixty-three compartments examined. The plants were largely absent from the south-east corner of the Heath (mainly given over to athletics and other sports), and from parts of the north-east. Elsewhere the bluebells were very widely scattered, though rarely particularly abundant. They occurred in secondary woodland and by hedges; in fact almost any shady spot might contain a few bluebells.

The results showed that the hybrid bluebell was the most widespread species on the part of the Heath that was surveyed, being recorded in twenty-eight out of forty compartments. Plants which appeared to be the wild bluebell were also widespread (twenty-one compartments), while plants corresponding to the description of the Spanish bluebell were found in twelve compartments.

Little could be drawn from the distribution of the three taxa. It seemed that any one of the three could be found in any situation. There was a slight tendency for plants scored as wild bluebells to be associated with old hedges, and with oldish woodland, but this species also occurred quite frequently, though in small quantity, in other habitats.

Discussion

A hundred and fifty years ago, bluebells no doubt occurred here and there in suitable habitats throughout the area now encompassing Hampstead Heath. At that time there was much less woodland than there is now. Tansley (1913) refers to their presence in Ken Wood, while noting that all ground vegetation in that wood was 'extremely sparse'. He also refers to a report that the plant was found on the East Heath. In the same work Whitton (1913) refers only to bluebells occurring in the nearby Bishops Wood, a wood now almost entirely destroyed. These references are to the wild bluebell.

Human activities may have affected the distribution of bluebells in at least three ways. Firstly, it used to be a favourite activity in the past for town-dwellers to go into the countryside in May and bring back armfuls of wild bluebells. Any locality on Hampstead Heath with a sizeable population of bluebells would probably have been affected by this practice. Though the picking would not have killed the plants, it would have prevented them from seeding. The decline of this mass flower-picking may have contributed to the survival and spread of the plant.

Secondly, the planting of wild flowers on the Heath has been carried out by the Heath administrators at various times and particularly in the last twenty years. Bluebells would be seen as attractive flowers, easy to plant, and would probably have been among the first candidates to be planted. The bulbs may have been those of the wild bluebell, the Spanish bluebell or the hybrid.

Thirdly, in the course of the last hundred years the Heath has gradually been surrounded by suburban housing in many of whose gardens bluebells of one sort or another have been planted. From time to time unwanted bulbs may have been tossed out onto the public open space, or the plants gradually spread onto the Heath.

Conclusion

It may be that bluebells are now commoner on the Heath than a hundred years ago, when there was much less woodland and scrub, and perhaps much more ruthless bluebell picking. But while at the beginning of the twentieth century the bluebells then present were almost certainly the wild bluebell *Hyacinthoides non-scripta* this species is now outnumbered by the hybrid and Spanish forms.

The above survey attempted to discover the bluebell populations at one particular time. It is hoped that in the years to come, further analyses can establish whether there is any change in the proportions of wild, Spanish and hybrid bluebells present on the Heath.

Acknowledgements

Thanks are due to all the members of the Hampstead Heath survey team who recorded the presence of bluebells on the Heath.

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The reintroduction of *Calluna vulgaris* to Hampstead Heath

(Richard Payne, Conservationist, Corporation of London)

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Introduction

Hampstead Heath is one of the largest areas of open space in London and one of the most familiar to Londoners, covering approximately 800 acres (320 hectares). The management and use of the Heath has changed greatly over the years and this has had a dramatic effect on the flora and fauna. Paintings of the Heath, and photographic records from the turn of the century, show a much more open landscape with patches of gorse and broom. Some of these views today are dominated by secondary woodland much to the detriment of any previously noted heathland plant communities. The decline of heathland plant and animal communities on Hampstead Heath can be attributed mainly to the cessation of grazing by commoners, allowing woodland development, increased levels of recreational use and the extraction of sands and gravels.

Only one sixth of the area of lowland heath present in England in 1800 now remains, and of that some areas are under threat of development or lack of management leaving other areas in a degenerate condition, but the remaining area still represents an important proportion of the international total. This fact has been recognized by naturalists for decades and in 1993 English Nature began its lowland heathland programme which focused organizations involved in heathland restoration to work together and develop methods and techniques to reduce the decline of our heaths.

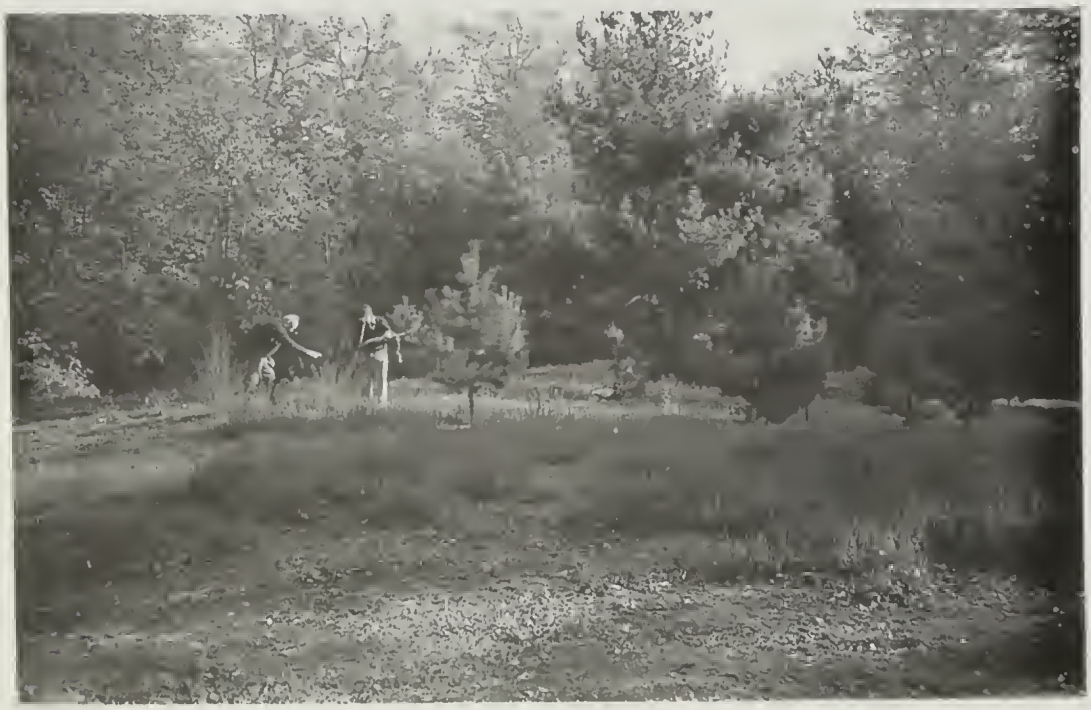

FIGURE 1. Society members surveying an area of planted *Calluna* on Sandy Heath, October 1997. *Photo: C. Bowlt*

In response to this alarming decline it was decided by the former Greater London Council (GLC) in the early 1980s that an attempt to reintroduce *Calluna vulgaris* on two sites on the Heath should be undertaken. An area of approximately 50 square metres of heather was translocated to a south-facing slope on the Vale of Health (Grid Ref. TQ 866265) which established well, containing a small amount of common dodder *Cuscuta epithymum*. In addition to this a smaller area was planted by the conservators of the Heath with the aid of Mr Tony Banks MP onto a site on Sandy Heath (TQ 867262). The two areas are still present today and although they have not expanded greatly since planting they have not become dominated by other aggressive species despite there being little management to these areas within the past ten years (Figure 1).

After the abolition of the GLC a transitionary period of management took place with the Corporation of London becoming the new custodians of the Heath in 1987. Because of the success of the previous plantings a strategy was developed to continue with the re-introduction of heathland plant communities. A brief account of this restoration programme is given below using four sites as examples.

The reintroduction of *Calluna vulgaris*

The first stage was to establish any areas where the underlying geology would be conducive to the development of a *Calluna* sward. Although man has altered much of the Heath's topography, remnants of it still reflect the natural geology of the area. The Heath is one of the few areas of Bagshot Beds close to central London and is resting on London Clay amongst the sandy transition of Claygate Beds. Small patches of pebble gravel occur on the Heath overlying the Bagshot Beds. Human activity and the development of secondary woodland have had a dramatic effect on the soil types found on the Heath today.

One of the main problems encountered when attempting to establish *Calluna vulgaris* and other heathland plant communities is the deposition of leaf and humus litter onto the originally exposed mineral soil described above. Years of successional vegetation change has resulted in nutrient levels that are far in excess of those found in typical heathland soils and a large residual seed bank composed mainly of undesirable species has developed within this upper soil horizon. Unless these residual nutrient levels and the remnant seed bed are reduced there is a tendency for recolonizing vegetation to be dominated by species such as nettle, other arable weeds and an eventual succession back to bracken or scrub-dominated communities. Therefore the removal of the top horizon of partly decomposed leaf litter has proved to be of paramount importance. Experimental areas were established where leaf litter removal was compared with the mixing of the soil horizons with the use of a mechanical cultivator. Results showed that the cultivated area reverted within one season to its previous vegetation type (bramble, bracken). In comparison, the area where the litter layer was removed back to the mineral soil remained virtually vegetation-free all season.

As a result of this and observations from other heathland restoration projects, Epping Forest being one example, it was decided that scraped areas would be used for the re-establishment of heath flora. The sampling of the underlying geology with the use of a soil auger helped identify areas where restoration looked possible. This also indicated the amount of material that needed removing and helped establish the quality of the strata below. A small mechanical excavator with a one-metre-wide bucket proved to be a precise and efficient method of first removing, then regrading, the spoil elsewhere on site. Following this preparatory work *Calluna* plants grown in modular plugs (supplied by British Trees and Shrubs Ltd) were planted on sloping areas and seed from Thursley Common National Nature Reserve in Surrey was spread onto the bare mineral soil on the flatter sites. It was decided that the seed should be left on the surface as an important factor in the increased viability of heather seed is its exposure to ultraviolet light and fluctuating temperatures, conditions which are characteristic of cleared or burnt areas. In addition it is viewed that a consolidated substratum improves germination compared to a loose one. (Smith,Webb and Clarke 1991)

Germination rates are greater when the seed is exposed to heat at the rate of 120° Celsius for a period of thirty seconds, conditions similar to typical flash fire on a heathland site. It has also been recently discovered that in addition to the more obvious effects of heat, chemical compounds found in the smoke are responsible for stimulating the germination of seeds of some South African *Erica* species. There is also a primer solution, containing natural substances, which is found to overcome dormancy and stimulate seed germination. This is available from the Kirstenbosch National Botanical Garden, South Africa and is used in commercial propagation techniques. I hope to experiment with these methods in certain trial areas and monitor the results in the future.

The first signs of germination became apparent in late April 1996 when 1–3 mm seedlings were found scattered in patches throughout the site. On further examination it appeared that germination rates were greater on areas with small topographical distortions, i.e. small hollows, ridge edges or depressions, it also became apparent that seeding development was at an advantage when sheltered by objects such as fallen logs etc. No evidence has been seen of vegetative growth from root fragments imported in with seed. It was found that young developing plants are greatly affected by desiccation, and as a direct result of this observation newly seeded areas are now lightly irrigated during this crucial period of development resulting in greatly reduced seedling mortality. This also became apparent during the summer of 1998 when a large area of Bagshot Sand on a south-facing slope was exposed as the result of some capital works undertaken on the Heath. This area was seeded with heather mulch (soil scraped from under a twenty-year-old heather stand) collected from Dunwich Heath in Suffolk. Virtually no germination or seedling development took place within this area which I believe was due to the high temperatures and low moisture levels often encountered on this site. Once the pioneering phase is under way and regular irrigation is carried out during dry spells a dense sward can develop. This pioneering phase takes approximately two or three years during which the areas of bare ground often develop a rich and diverse bryophyte community which has a suppressing effect on other more aggressive 'weed' species. Another beneficial effect of the development of these bare earth areas has been their colonization by solitary mining bees and wasps. I also observed a common lizard on one of these sites in April 2000 (a stowaway visitor with the Suffolk or Surrey seed, maybe?).

The long-term maintenance once beyond the pioneering and early building phases consists of rotational cutting, which allows different age structures to develop and also encourages a more prostrate habit, suppressing any invasive weeds. This also appears to check the establishment of woody species, notably birch. Cutting takes place after flowering and these clippings are sometimes used as a seed source in the development of other areas. One factor that appears to affect the survivability of heather is the dense accumulation of fallen leaves in the autumn and winter period. This on occasions is blown by the wind into what is best described as leaf drifts. If these drifts build up upon young developing plants they can be suppressed or killed within a short period. The blowing away or removal of the larger accumulations can counter this. I would also advocate the rapid removal of any purple moor grass *Molinia caerulea* encountered within the establishing areas due to its pernicious and aggressive nature, and it has been noted that it is expanding its range into other areas of the Heath. When obtaining seed from heathland sites I always ensure it is not cut from a stand that may contain any *Molinia*. The planting of heather in plug modules has proved to be a highly successful method of establishing stands on slopes and other acute undulations (often encountered on Hampstead Heath) where seed may be subject to removal due to rainfall or foot traffic. On a visit to north Wales recently I witnessed the large-scale planting of *Calluna* and bilberry *Vaccinium* by the National Grid Company after the development of a hydroelectric scheme. This method of quick-fix restoration has been used by them for a number of years and is particularly suited to steep gradients in high rainfall areas where establishment from seed is unreliable.

A brief description of developed areas is given below outlining the previous vegetation type found on site and the re-establishment methods used.

Site guide of trials undertaken

Site No. 1. Location Sandy Heath. Grid Ref. TQ868262. Area 195 sq.m.

SOIL TYPE. Sand with Bagshot lenses capped by a 5–15 cm humus layer.

PREVIOUS VEGETATION TYPE. *Ulmus procera* and *Pinus silvestris* with an understory of *Rubus fruticosus* and a small amount of *Holcus mollis.* A large proportion of elm had died due to Dutch elm disease and regeneration of suckers was quite low. The bramble was suppressed by the elm as was a small group of 20–25 pines.

METHODS USED. The elm was felled and the bramble cut down using a flail mower. The pines were thinned leaving the best specimens. The seed bank and the leaf litter horizon were removed by scraping, using a tractor-mounted excavator exposing the mineral soil below. The leaf litter was disposed of and regraded in a hollow near by. Approximately 150 *Calluna vulgaris* plug modules were planted. These were grown from cuttings taken by a supplier specializing in indigenous species. The area was overseeded with heather clippings taken in September/October 1996 from Thursley Common in Surrey. These are arisings taken from a 10–15-year-old stand as part of their annual maintenance programme.

RESULTS. The removal of the humus layer greatly reduced any recolonization of aggressive species allowing the *Calluna* to develop and establish rapidly. Plugs were planted at a density of approximately 15 per sq. m. and the tops were trimmed to encourage side branching. The germination rates of the seed were high due to good soil moisture content.

Site No. 2. Location West Heath. Grid Ref. TQ868260. Area 474 sq.m.

SOIL TYPE. Podsoil/pebble gravel capped by 10–20 cm of leaf and bracken litter.

PREVIOUS VEGETATION TYPE. Small sycamores with an understory of bracken.

METHODS USED. The sycamores were grubbed out and the bracken was cut down. The site was then scraped to remove the leaf litter. The site was left until the following summer of 1996 to allow the bracken regrowth to appear. This was then sprayed with Asulox (a selective herbicide). The bracken was then removed and approximately 350 *Calluna* plug modules were planted and the area overseeded with clippings from Thursley Common NNR. The planting density was reduced in patches to leave areas of bare sand with the intention of creating microhabitats for invertebrates.

RESULTS. Establishment of seedlings has been satisfactory with good germination rates of broom and gorse from the original seed bank. This site has been expanded during the autumn of 1998 and overseeded with heather litter (soil taken from under a 30-year-old stand) obtained from Dunwich Heath in Suffolk.

Site No. 3. Location West Heath. Grid Ref. TQ868259. Area 51.5 sq.m.

Soil type. Humus-rich sand.

Previous vegetation type. Japanese knotweed *Fallopia japonica.*

Methods used. The knotweed was treated with Roundup Biactive herbicide for two seasons and any remaining rhizomes were grubbed out by hand. The leaf litter was scraped off and 200 *Calluna* plugs were planted.

Results. The plants have been slow to develop due to the north-facing aspect and leaf fall partly suppressing growth in autumn. Any residual knotweed has now been removed by hand and leaves are cleared off the plants.

Site No. 4. Location West Heath. Grid Ref. TQ868254. Area 315 sq.m.

Soil type. Humus-rich sand capped by 10–25 cm of bracken litter.

Previous vegetation type. Dense bracken stand.

Methods used. The bracken was sprayed during the summer of 1996 with the herbicide Asulox. The bracken litter was subsequently removed in the autumn. The area was overseeded with *Calluna* seed taken from Dunwich Heath the following spring.

Results. Germination rates were extremely high with approximately 80–100 seedlings developing per square metre of area. This is due to high moisture levels during the growing season and the good quality of the seedling material used. The highest seedling densities have occurred with the use of soil taken from under a 10–20-year-old *Calluna* stand.

Additional areas and conclusions

Further areas in addition to the four I have given as examples in this article have been developed using the above methods. One method that has proved highly satisfactory is the scarification and seeding of eroded areas of ground amongst acid grassland. The development of *Calluna* in such areas appears to be slower attaining a height of 20–30 cm within five years. Many of the ideas and methods used were described in the papers from the field experiments undertaken at Mount Pleasant, Dunwich, Suffolk by Dunsford and Davy during 1993/4 where they were conducting trials into the regeneration of old agricultural land back to former heathland. This work has been of great help in this project. One finding of theirs was that bracken leaf litter on exposure to the air would oxidize and become too acidic for successful *Calluna* restoration. I found contrary to this that bracken litter provided one of the best seedbeds, possibly due to its moisture retentiveness.

Dunsford and Davy (1994) state that a combination of 45 per cent peat to soil ratio is conducive to *Calluna* seedling establishment, so we are at present conducting a trial where seed has been incorporated with our own home-produced compost (pH 6.5). This mix has been spread out on an area of exposed sand and we are eagerly awaiting the results. Some of the methods used in the project may seem to be slightly unorthodox in their approach, especially when compared with more traditional methods used in heathland restoration. I do however feel that Hampstead Heath differs from more rural locations in many ways: two of the main ones are its location within a dense urban environment and its high levels of visitor usage. This has effects upon the methods of re-establishment used due mainly to the effects of high levels of foot traffic. This sometimes necessitates that fencing is required for protection during the establishment phase and experimentation has shown the use of planting as the most satisfactory method of developing stands on eroding slopes. Observations over the years indicate that there has been no evidence of natural *Calluna* regeneration from a remnant seed bank. This I believe is due to the long period of transitional succession that has occurred between heathland species and the flora found on the site today, making any remnant seed unviable.

All areas were surveyed and measured in March 1999, the total coverage of established heather is 1,730 sq.m. The area of pioneering/developing stands is 1,620 sq.m. Support received from Heath users has been encouraging and continues to grow as the new areas develop and become established. The conservation unit has actively encouraged members of the public to become involved with this project over the past few years through volunteer days and working groups run through the British Trust for Conservation Volunteers (BTCV). In addition to this a newly founded group of local volunteers called Heath Hands has recently developed a small area of heather plantings in the Vale of Health area expanding on the original 1980s plantings undertaken by the former GLC.

Monitoring of the project is undertaken as part of the ongoing LNHS study of the Heath. It is hoped that this reintroduction project is adding positively to the varied habitat mosaic found on the Heath at present as well as being of educational value in the promotion and conservation of heathland sites found elsewhere.

Acknowledgements

I wish to thank my colleagues on the conservation unit, the Heath management, members of the London Natural History Society and above all the support and encouragement of the public without whom this project would not have been possible.

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The birds of Sandy Heath (Colin Bowlt)

A survey over three years was carried out to assess Sandy Heath as a habitat for birds. Sandy Heath is a misnomer — the sand was dug out long since, and with it the heath (Figure 2). It covers 21 hectares (52 acres) on the north-west side of Spaniards Road and runs downhill to the Heath Extension. The area is now largely covered with secondary woodland with little or no ground flora or shrub layer except along the south-west and north-east sides. In the southern corner there is a grassy area of about 1 hectare (2.5 acres) known as the Paddock, and towards the centre there is one largish pond and two smaller ponds/wet areas. The trees are mainly oak, beech and birch with smaller numbers of other species such as horse chestnut and planted pines.

Three to four hours were spent covering the area on each of the recording days. Census methods have been discussed for example by Simms (1971). The method used here was not a transect method but attempted to count all the birds present. Although some birds will have been missed the open nature of most of the wood makes it unlikely that the numbers counted were far out. The approximate similarity of the results from the recording days shown in Tables 1 and 2, coupled with other less systematic observations, suggests that the results were representative of the bird species and numbers on Sandy Heath between 1996 and 1999.

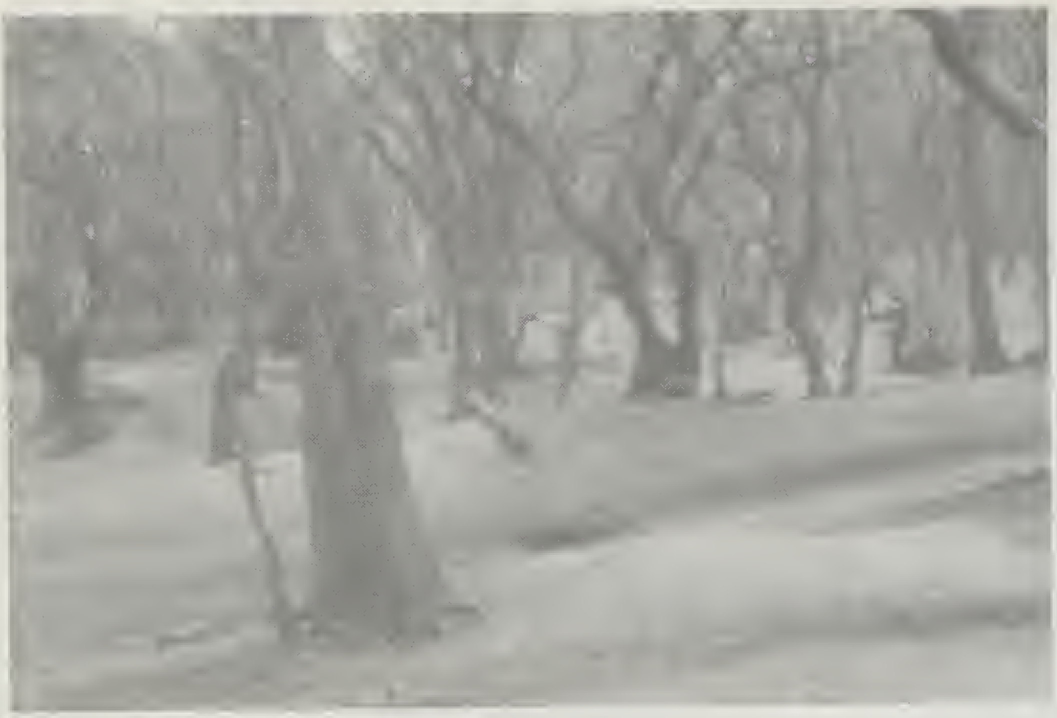

FIGURE 2. Sandy Heath, showing the dearth of undergrowth in the centre of the woodland which has developed on the old sand/gravel diggings. *Photo: C. Bowlt*

Bird positions were mostly detected by song or call. Winter counts were more difficult due to bird movement through the wood but it is considered that this did not distort the results greatly. In the time available no attempt was made to determine territories, or even which species were actually breeding on Sandy Heath. The number of species present in spring for breeding or feeding was between 15 and 21. The total number of adult birds recorded varied between 58 and 83, though irregular flocks of woodpigeons and broods of juvenile starlings feeding in the tree canopy (as on 25 May 1997) occasionally boosted numbers. Fewer species and numbers of birds used the area in winter. The number of species varied between 9 and 16, and the total number of birds recorded varied between 17 and 149. This latter number included a flock of forty mallard on the pond and forty-three woodpigeons, and well illustrates, along with the isolated flock of redwings, the transitory nature of the winter bird population.

Comparison with other woodlands in the London area indicates that Sandy Heath has an impoverished bird population. For instance, a Wimbledon Common census 1973–80 (Kettle 1983) found an overall density of 100 pairs per 10 hectares. Strict comparison is not possible but even if it is assumed that all the birds recorded in spring at Sandy Heath had uncounted mates the maximum bird density would only be about 40 pairs per 10 hectares. More recent counts for individual species from the Bookham Common Survey 1995–7 (Prowse 1998) gave 265–296 pairs of robins, 62–117 pairs of wrens, 62–80 pairs of blackbirds and 123–191 pairs of blue tits per sq. km. (10 hectares). Again, even assuming all recorded birds were one of a pair, then corresponding figures for Sandy Heath would be only 20–65 pairs of robins, 20–45 pairs of wrens, 5–55 pairs of blackbirds and 25–50 pairs of blue tits per sq. km. Winter numbers also appear to be very low. The structure of the woodland of Sandy Heath with its little or no shrub or ground layer over so much of it is probably the main reason for its relative unattractiveness to birds for both nesting and feeding.

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TABLE 1. Numbers of adult birds recorded in spring.

Species	**1997** 27 April/25 May	**1998** 12 May	**1999** 25 April/19 May
Mallard	2/2	2	0/0
Moorhen	0/0	1	0/1
Woodpigeon	25/2	0	1/25
Gt sp. woodpecker	1/3	2	1/1
Wren	4/6	5	9/9
Dunnock	0/2	0	0/2
Robin	6/4	13	4/12
Blackbird	1/7	9	7/11
Song thrush	0/0	0	1/1
Mistle thrush	0/1	0	1/1
Blackcap	4/5	3	3/2
Chiffchaff	4/2	2	3/2
Long-tailed tit	4/2	0	5/3
Coal tit	0/0	0	0/1
Blue tit	8/10	8	10/5
Great tit	8/2	2	6/5
Nuthatch	1/1	0	1/0
Treecreeper	2/2	1	0/0
Jay	3/1	1	1/3
Magpie	6/3	3	0/5
Carrion crow	4/3	5	3/2
Starling	0/many	0	0/1
Chaffinch	0/1	1	0/0
Greenfinch	0/1	0	0/0
Bullfinch	0/0	0	0/3
Number of species	16/21	15	15/20
Number of birds	83/(60+many)	58	71/79

TABLE 2. Numbers of birds recorded in winter.

Species	**1996** 30 November	**1997** 30 November	**1999/2000** 16 Dec./31 Jan.
Mallard	2	40	1/0
Kestrel	0	1	0/1
Woodpigeon	1	43	13/32
Gt sp. woodpecker	0	1	1/0
Wren	0	3	5/0
Robin	1	2	2/1
Blackbird	1	2	3/0
Redwing	0	14	0/0
Mistle thrush	0	1	0/0
Goldcrest	0	1	7/2
Long-tailed tit	0	12	5/19
Coal tit	0	0	2/2
Blue tit	1	9	8/16
Great tit	0	0	2/4
Nuthatch	0	1	1/2
Treecreeper	1	0	1/0
Jay	1	3	4/0
Magpie	4	7	1/4
Carrion crow	5	9	9/8
Number of species	9	16	15/11
Number of birds	17	149	52/91

White-letter hairstreak *Strymonidia w-album* butterflies on the Heath (Colin Bowlt)

'It would appear, however, that the white-letter hairstreak has always been an uncommon butterfly in the London area. . . . Its principal food has been said by most authors to be the wych elm *Ulmus glabra*, and whilst this may or may not have been the case elsewhere, it certainly does not apply to the London area, where almost invariably the English elm *Ulmus procera* is chosen.' (Plant 1987).

Until 1993 the white-letter hairstreak had apparently never before been recorded on the Heath. In that year Percy Williams had sightings at Sandy Heath on 27 July, and the Vale of Health on 7 August. This was a very good year for the species elsewhere generally, with reports of sightings from many localities where it was not usually seen.

In 1994 there were sightings between 12 July and 4 August — mostly from Sandy Heath. The finding of a chrysalis on elm scrub on 10 June, which subsequently emerged and was released after identification, positively proved breeding. In 1995 a colony was located on Sandy Road and another on the edge of Wildwood Road, plus sightings elsewhere.

Butterflies were seen in 1996 between 27 June and 29 July with egg laying observed on 18 and 21 July. Four colonies were located, but, ominously, signs of Dutch elm disease appeared on the colony trees. There were fewer sightings in 1997. The original colony tree on Wildwood Road was completely dead and the best wych elms were all affected. In 1998 there were only two sightings, and these proved to be the last. The wych elms had all succumbed, but a good number of unaffected young common elms continued nearby.

There were no sightings in 1999. Thus ended the six-year rise and fall of the white-letter hairstreak on the Heath — at least for now. 'This hairstreak is extremely local and a small colony will breed, year after year, on a certain old wych elm, while a group of identical trees in the vicinity do not yield a single caterpillar when searched at the appropriate season' (Newman 1968). It seems curious that colonies become so localized to a particular tree and do not shift to nearby healthy elms when their colony tree is attacked by Dutch elm disease.

Acknowledgement

This is based on the annual reports of the butterflies on Hampstead Heath by John Maxwell who very kindly gave his permission.

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Book review

Handbook of Palaearctic macrolepidoptera. Volume 1: Sesiidae — clearwing moths. Karel Spatenka, Oleg Gorbunov, Zdĕnek Laštůvka, Ivo Toševski and Yutaka Arit. Gem Publishing Company. 1999. xvi plus 576 pp., 489 colour illustrations, 504 line drawings (of which 494 depict genitalia), distribution maps for all species. 198 × 271 mm, hardbound, ISBN 0 906802 08 3. Available from Gem at Brightwood, Brightwell-cum-Sotwell, Wallingford, Oxfordshire OX10 0QD at £120 plus £5 UK p. & p. (£10 overseas).

This *magnum opus* is the first in a new series, intended to replace the now largely out-dated work by Seitz on Palaearctic macrolepidoptera, which was produced between 1904 and 1954. The new series is fortunate in having, as its Managing Editor, Clas M. Naumann — one of Europe's leading lepidopterists, and is to be published in single volumes devoted to major groups (superfamilies, families or, occasionally, smaller groups). All manuscripts are to be refereed by at least two independent referees before publication. We are not told how many volumes will be involved in total, nor are we given a projected frequency of occurrence, though it is stated in the Editorial Preface that 'Those taxa that have suffered from a history of over-splitting and with little emphasis on critical revision, and that lack competent modern specialists are unlikely to be treated . . . in the very near future'. The rear dustcover indicates that volumes on Papilionidae, Hesperiidae, Saturniidae, Brahmaeidae, Lemoniidae and Zygaenidae: Zygaeninae are in preparation whilst coverage of the Noctuidae is flagged as a priority.

This first volume covers the clearwings presently known from the Palaearctic Region; these seem to vary in number from 309 on the inside front of the dust-jacket and in the sales literature to 317 in the text on distribution on page 11 (I count 317 in the synonymic checklist on pages 17–21; the sales blurb also states that there are 487 colour illustrations, whereas in my copy they are numbered from 1 to 489 — and I really can't be bothered to check if the sequence is entire). No new species are brought forward by this work and there is no taxonomic revision; the sequence and nomenclature used are justified in the introductory section. An identification key is presented, before the species accounts, to the 26 European genera and within each text section the Palaearctic species are keyed for each genus. The exception to this is within genus *Bembecia* Hübner, which is particularly species-rich and is, therefore, split into regional subsets. After a brief, but very useful, introductory section, which includes a potentially most helpful table of host-plants, the genera and species are treated in a most comprehensive manner. I have freely to confess that the bulk of the species in this book are quite unknown to me, though that in itself makes the work a fascinating read. Selecting, therefore, a species that is of particular personal interest, *Synanthedon myopaeformis* (Borkhausen), I discover text occupying two pages and subdivided into sections covering synonymy, literature, diagnosis, variation, male genitalia, female genitalia, differential diagnosis [similar species], bionomics, habitat and distribution, the latter including a map; this appears to be a standard treatment for all the species apart from those so poorly known that there is actually rather little to say about them. Within the section on diagnosis, reference is made to the appropriate plate (which in this particular case includes three separate figures), but unfortunately there is no reference on the colour plate page to the appropriate text page (a considerable failing of the first volume of *British tortricoid moths* that was put right in the second volume). There is a similar failure to back-reference the genitalia drawings. I hope that the editorial board will take note of this for future volumes. The colour plates are masterful depictions of most of the species in watercolour, very well reproduced and apparently accurate.

Whilst many distribution maps are clear to understand, there is a lack of uniformity which makes some of them difficult to interpret. Thus, for *S. myopaeformis*, there is a map incorporating that region of the Palaearctic from Spain to the Caspian Sea and which is easy to understand, whilst for *S. scoliaeformis* (Borkhausen) we have a map stretching from western Africa to Japan. However, for *Bembecia vidua* (Staudinger), as an example, the map box contains half a dozen enclosed areas (presumably water bodies) that could almost be anywhere, and no national or marine boundaries. This map contains only a single dot, and the text explains that the moth is only known from the type locality (Uzbekistan) and from Kyrgyzstan (which I judge to be two localities in total), and I wonder why it is that this dot could not have been placed on a map that had at least one easily recognised geographical feature that would indicate where in the Palaearctic it is supposed to be!

In a work of this size and complexity there will inevitably be errors of the type that I have picked on above, particularly so, perhaps, in the first volume of the series. Hopefully, all will be taken into account during the preparation of future volumes. In the meantime, it can be said that none really detracts from the overall importance and usefulness of the work and in areas where errors might be important I can find none. This is a volume in a series that is certain to become the standard work on Palaearctic macro moths and, since it includes all of the British and Western European species, will be of great interest to readers of this journal whose interest in moths is serious. The price is high, though it is justified by what you get for it, and I strongly recommend that you start collecting the series now since the future cost of obtaining missed volumes could become enormous!

COLIN W. PLANT

Botanical records for 1999

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Abstract

A selection of records of vascular plants from the London Area is presented. They include the first record of *Pyrola rotundifolia* from vice-county 17 (Surrey) and perhaps also from London.

Introduction

This paper continues a long sequence presenting selected records of vascular plants in the preceding year, from a region approximating to a circle of radius 32 kilometres, centred on St Paul's Cathedral (the London Area). The records are in a standard sequence based on the division of Britain into vice-counties devised by Watson (1873), but also taking into account modern administrative boundaries.

The year in question may or may not have been the last of the millennium, but it was certainly the last of recording for the proposed Botanical Society of the British Isles publication *Atlas 2000*. Many of our members have helped with this by attempting to update less-recent records and fill unremarkable gaps, so the proportion of remarkable new discoveries may be smaller than usual. A preliminary report on the records collected for this publication (Dines 2000) gives two of the recording squares from our area the highest totals of any in the country; in one of these the numbers were greatly swollen by the inclusion of native species planted at Barn Elms (Burton 1998: 230). Checking records submitted for *Atlas 2000* gave me the opportunity to reconsider the status of many of our recorded aliens.

V.C. 16, West Kent

Of the records received from localities in Lewisham and Greenwich, the only ones I shall mention are Ken White's rosy garlic *Allium roseum* and two-flowered everlasting-pea *Lathyrus grandiflorus* naturalized in Brockley Cemetery, vouched for by photographs he sent me, and two from the latter borough, a plant of patience dock *Rumex patientia* found by Graham Myers on waste ground at Thamesmead, which failed to key out according to the books because of a total lack of tubercles on the fruiting valves, and Margot Godfrey's house holly-fern *Cyrtomium falcatum* on walls and floors of the winter garden at Avery Hill. This might be thought not worth mentioning because of the too obviously artificial environment, but the same observation was made in the same place fourteen years earlier by John Palmer and the fern's naturalization there may well date from over a century ago. The environment is not so very different from the totally derelict nursery where *Cyrtomium* and other ferns were reported naturalized by Wurzell (1993). From among Mrs Godfrey's records from her home borough of Bexley, the one which interested me most was the abundant strawberry clover *Trifolium fragiferum* in mown lawns close to Lesnes Abbey, because I am reasonably confident that it was not there when I studied this grassland closely thirty years ago. Mr Palmer's from this borough include two stonecrops and two unusual hybrids. Lesser Mexican stonecrop *Sedum confusum* and greater Mexican stonecrop *S. praealtum* were scattered on soil heaps near the River Cray between Bexley and Crayford; although abundant in one or two places, they still have to be regarded as casual. Near the West Kent Main Sewer further down-river, together with abundant dittander *Lepidium latifolium* (of which more anon) there was a plant of the hybrid burdock *Arctium lappa* × *minus*. Opinions have changed about the frequency of occurrence of natural *Arctium* hybrids; the most recent monographer of the genus (Duistermaat 1996) examined very large numbers of herbarium specimens and found extremely few unequivocal hybrids. The other was a possible *Geranium molle* × *pusillum*, which would be new to science, on waste ground near Hall Place. It had five anthers, hairy fruit and abundant glandular hairs on the stem. David Nicolle's records include a large patch of Turkish tutsan *Hypericum xylosteifolium* off Parkhill Road known to him for many years, and a flowering plant of *Solanum crispum* on a rubble heap near Upper College Farm. I was able to confirm the continued presence of the scarce species Borrer's saltmarsh-grass *Puccinellia fasciculata* and corn parsley *Petroselinum segetum* (the latter with its special gall on the flowers) in what may be their last remaining London locality, on Thames Water's nature reserve east of Cross Ness. In Bromley I was able to find more than twenty tufts of thin-spiked wood-sedge *Carex strigosa* in what may be its last London locality in Scadbury Park, but when I tried to refind lily-of-the-valley where Francis Rose directed me to it at the foot of Logs Hill I found the site had been built on. In compensation, there was a roadside patch of southern woodrush *Luzula forsteri* under a chestnut tree, together with the commoner hairy woodrush *L. pilosa* and their hybrid *L.* × *borreri*. Geoffrey Kitchener found a single large plant of narrow-leaved ragwort *Senecio inaequidens* on the pavement of the bridge at Chelsfield Station.

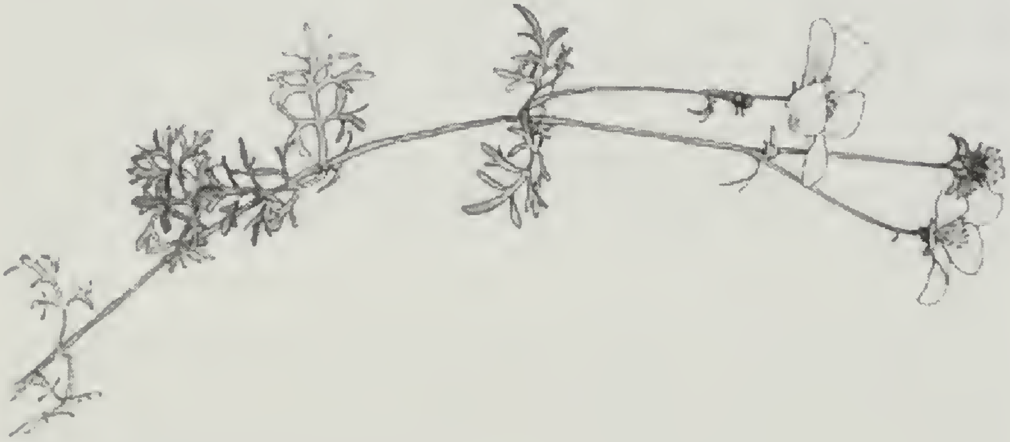

FIGURE 1. *Bidens ferulifolia* (Jacq.) DC.

Passing to that part of vice-county 16 which is in the London Area but outside the boundary of the Greater London Authority, the records from Mr Kitchener which I choose to mention here are from Littlebrook Nature Reserve, a site of increasing importance as the riverside marshes below London become more and more 'developed'. Fan-leaved water-crowfoot *Ranunculus circinatus* is very seldom seen nowadays. Evidence that the reserve also has dry ground suitable for colonization by wind-borne seedplants is provided by the bee orchid *Ophrys apifera*, the pyramidal orchid *Anacamptis pyramidalis* and by *Senecio inaequidens* which here is likely to be derived from the large colony across the Thames (see below). The details given by Kitchener and Palmer (2000) make it clear that there were actually four different places in the Dartford–Stone area where it appeared. On the occasion of the joint meeting of the Wild Flower Society and the Kent Field Club which Mr Kitchener led on 12 September, a more unexpected plant found was autumn lady's-tresses *Spiranthes spiralis*, which unlike the other two orchids mentioned has never been found on the nearby Chalk. In chalk grassland at Longfield, Mr Palmer has known since 1990 a *Prunus* which he now suggests is a hybrid between cherry-plum *P. cerasifera* and blackthorn *P. spinosa*. As the only evidence of hybridity is an almost total lack of fruit-set, but there are numerous plants, including young ones, the hybridization event must be occurring repeatedly. The plants are quite spiny below, the young stems are very green as in *P. cerasifera*, but the plants flower less early and the wide angle of branching is more like that of *P. spinosa*. The north African species *Erodium trifolium*, which sets seed very readily in my garden and a neighbour's, appeared as a weed on the streets of an old housing estate at Sutton at Hone. On soil heaps in rough grassland at New Barn, near Swanley, Mr Palmer found *Bidens ferulifolia* (Jacq.)DC. My own records include three of this species from Eynsford, self-sown below hanging baskets and window boxes. There is only one previous record of this species from London, but there are more to come in this account of 1999 records, so I judge it to be worth an illustration (Figure 1). The five broad ray-florets are of a good orange-yellow colour. Also I should mention the single plant of slender tare *Vicia parviflora* which appeared mysteriously in my own garden.

V.C. 17, Surrey

John Edgington sent me a record of several fruiting plants of rue *Ruta graveolens* north of Surrey Docks, in Southwark. There were a number of interesting records from Wandsworth in a list sent to me by Barry Nicholson. Orange balsam *Impatiens capensis* on the Thames wall in Battersea would have been brought downriver as seed, whereas *Valeriana officinalis* in a similar location must have come on the wind — from where? Waste ground at the rear of Graveney School was the habitat of *Lepidium latifolium* which he had expertly identified as var. *velutinum* Hayek ex Thell. This variety is distinguished by the velvety-hairy undersides of the leaves and what is known of its natural distribution is more southerly in Europe than the type's. The species occurs as a native plant in south-east England near the sea, and as a naturalized alien inland, including many places in our area. It would be interesting to investigate whether or not all the naturalized plants are var. *velutinum*. In 1965–76 we had records of the species from sixteen tetrads, mostly by canals west of London (Burton 1983: 18). The map here (Figure 2) shows records since 1990; they are from about twice as many, much more scattered tetrads. Dr Christine Cheffins told me about *Trifolium fragiferum* in rough grass off Stewards Road on the Savona Estate in Battersea, which she has known of for three years. Mr Nicholson also produced interesting records from waste ground by the Pickle Brook near Collier's Wood in Merton, Greek dock *Rumex cristatus* and several established bushes of Montpellier broom *Genista monspessulana*. Another of Barry Nicholson's records of *Lepidium latifolium* var. *velutinum* is from Fryland's Wood near New Addington in Croydon, a casual introduction with tipped material to make a new car park. Similar ground alongside the Tramlink line in South Norwood Country Park gave John Bedford various casuals including henbane *Hyoscyamus niger* and meadow-foam *Limnanthes douglasii*. John Williams reports that London rocket *Sisymbrium irio* survived the upheaval of the Tramlink construction site on the corner of Dingwall Road and George Street in East Croydon (I would have thought it might thrive on the upheaval). A more remarkable record from Croydon than any of these, by far, is the group of at least thirty plants of round-leaved wintergreen *Pyrola rotundifolia* found by A. Scott, A. Jennings and Jane McLauchlin on Riddlesdown. I have taken this first record from Surrey (in its original sense) and London (in its current sense) from the Surrey Flora Committee's newsletter. Dr McLauchlin also led the Committee's May outing in Selsdon Wood, which saw perhaps all the remaining London plants of herb Paris *Paris quadrifolia* and very large numbers of saplings of bird cherry *Prunus padus* up to twelve feet tall; this is not a native tree in southern England. Our only 1999 records from Sutton are my own. I refound various-leaved water-starwort *Callitriche platycarpa* in the River Wandle where Bryan Radcliffe had seen it twenty-five years before, and added musk stork's-bill *Erodium moschatum* to the list of plants made by John Archer in Bandonhill

Cemetery (Burton 1999: 201). I had two short but interesting lists of records from Richmond Park. John Hodge found several largish bushes of dwarf gorse *Ulex minor* in small deer-proof enclosures south-east of Spankers Hill Wood, an eight-metre length of wood small-reed *Calamagrostis epigejos* west of Martin's Pond, and heather *Calluna vulgaris* east of Pen Ponds. The latter has been extraordinarily elusive, considering its abundance nearby on Wimbledon Common. Paul Bartlett's significant find was heath dog-violet *Viola canina*, vouched for by detailed field notes. Dr Bartlett also reports rue-leaved saxifrage *Saxifraga tridactylites* on the river wall near Teddington Lock, which seems to be a new London locality for this much decreased plant. Mary Clare Sheahan showed me a specimen of nettle-leaved goosefoot *Chenopodium murale* from her own garden in Barnes. The long list of plants from the Barn Elms Wetland Centre (Burton 1998: 230–231) did not include the nationally scarce hair-like pondweed *Potamogeton trichoides*, found there abundantly and of natural occurrence by our meeting of 17 July. Howard Davies refound Jerusalem artichoke *Helianthus tuberosus* on the Thames path near Chiswick Bridge, previously seen there in 1981 and 1985.

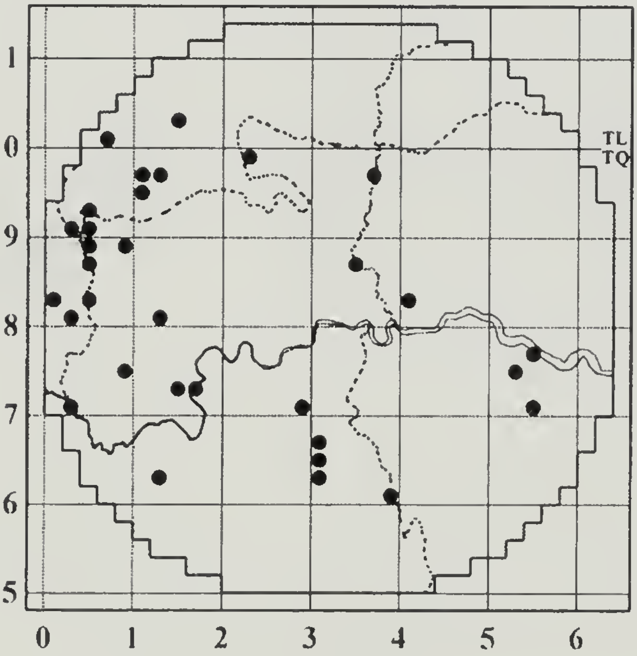

FIGURE 2. Tetrad records of *Lepidium latifolium*, 1990–1999.

From the *Atlas 2000* point of view, I regard the most significant part of v.c. 17 which is still administratively in Surrey as being Cooper's Hill near Egham, because this is the only genuinely wooded area in the hectad TQ07. Here Barry Phillips found a single plant of violet helleborine *Epipactis purpurata*, the first record of it from there since 1954. At Egham Hythe he noted that *Conyza bilbaoana* (confirmed by Eric Clement) is colonizing rapidly. Mr Phillips reported that *Lolium* × *boucheanum*, the hybrid of the perennial and Italian rye-grasses, was locally frequent on Chertsey Meads with both parent species, but according to the account of the June meeting of the Surrey Flora Committee, which visited the Meads, various forms of the hybrid were present but not Italian rye-grass. From Mr Hodge I had a note of the beneficial results of scrub clearance around Black Pond on Esher Common; many-stalked spike-rush *Eleocharis multicaulis* and common cotton-grass *Eriophorum angustifolium* have reappeared after a significant interval, and round-leaved sundew *Drosera* *rotundifolia* and other bog plants have also shown their appreciation. A less planned disturbance at the Howell Hill nature reserve had been followed by the appearance of a single plant of white helleborine *Cephalanthera damasonium*, reports Eileen Taylor. George Hounsome found a single plant of *Senecio inaequidens* in the middle of St Peter's Way at Chertsey. Our meeting on 9 October found several ferns on Oxshott Heath, including lemon-scented fern *Oreopteris limbosperma*, royal fern *Osmunda regalis* and hard fern *Blechnum spicant*, all rare plants in our area.

V.C. 18, South Essex

Knotted hedge-parsley *Torilis nodosa* is another species for which we have several records from new sites in recent years, though perhaps not enough yet to merit a map here. I found a lot of it near the western boundary of Newham around the entrance to the Transco premises. In the same borough, Prof. Edgington found *Plantago major* subsp. *intermedia* near high water mark on the tidal mud off Lyle Park. Subsp. *major* is of course greater plantain, a common weed, but subsp. *intermedia*, a smaller plant with thinner leaves of a paler green, which grows on damp, often saline, mud, has only three or four previous records from London. Another remarkable record is Jane Woodliff's heath pearlwort *Sagina subulata* very precisely localized in Central Park, West Ham. This is a long-extinct native plant in London, which in East Ham, as in Thornton Heath (Burton 1997: 196) was probably introduced a long time ago with turves. Miss Woodliff also sent me many extremely interesting records from Barking and Dagenham, including lesser water-parsnip *Berula erecta* and marsh woundwort *Stachys palustris* from around Bretons Lake, Dagenham and from Havering. Her *Torilis nodosa* was an abundant lawn weed in two front gardens in Elm Park Avenue, and harebell *Campanula rotundifolia* was in a similar situation in Upper Rainham Road. In Harrow Lodge Park she found about thirty plants of Jersey cudweed *Gnaphalium luteoalbum* growing out of silted concrete cracks by a stream; this is an extremely rare native species in Britain, but K.J. Adams has been able to establish that it was acquired for sale by a local nurseryman who had seen it in New Zealand where it is a naturalized alien, suggesting that the plants in the Park, the first recorded in London, came from seed blown from the nursery. Pale galingale *Cyperus eragrostis* by the same stream presumably had a different origin. On Rainham Marshes Miss Woodliff found a plant of catmint *Nepeta cataria* by a ditch, and narrow-leaved ragwort *Senecio inaequidens* on the Riverside Walk. This, like the single plant of the same species reported by Mr Kitchener by a slip-road under construction further west, the three plants by the silt lagoon on Rainham Marshes seen by Robin Blades and the plants in Kent already mentioned, are clearly all outliers of the huge population around Tesco's at Rainham, known since 1997, though first reported directly to me by Alan Lewis in 1999. Mr Kitchener did not mention *S. inaequidens* from Rainham Marshes, but he did list no less than seven dock hybrids, including the recently (Rumsey 1999) described *Rumex* × *akeroydii*, the cross between Greek dock *R. cristatus* and marsh dock *R. palustris*. In the pond at the west end of Capel Road on Wanstead Flats in Redbridge I found pedunculate water-starwort *Callitriche brutia* and orange foxtail *Alopecurus aequalis*; it is not at all easy to find native species overlooked in the very thorough searches of Ferris (1981). Adams (1999) gives many records of the foxtail, but none from Wanstead Flats.

Beyond the present London boundary, Miss Woodliff reported clustered bellflower *Campanula glomerata*, small scabious *Scabiosa columbaria* and other species close together from near the edge of Grays chalk-pit. Although the habitat is very suitable for these plants, there are good historical reasons for assuming that they are not native here; the most likely alternative is a deliberate introduction. Mr Blades reported established rose-of-Sharon *Hypericum calycinum* from near Sewardstone. The remarkable (I hesitate to say 'interesting') thing about this record is that although the plant is undoubtedly in v.c. 18, the exact locality of the plant is west of the Flood Relief Channel, so that the recent boundary change puts it in the London Borough of Enfield.

V.C. 19, North Essex

The only 1999 record received from this part of our area is yet another large colony of *Torilis nodosa*, found by Ken Adams at the edge of an arable field near Roydon.

V.C. 20, Herts.

Our meeting on 22 May, led by Mr Blades, visited Broxbourne Woods. These are well-known botanically, but we managed to add a dozen taxa to the records of the Hertfordshire Flora Survey, of which the most notable are huge quantities of seedlings of Lawson's cypress *Chamaecyparis lawsoniana*, up to at least a metre in height, by a track in the north-east corner of the wood, and near to the main ride the subspecies *congesta* of heath woodrush *Luzula multiflora*, as well as the commoner type species.

V.C. 21, Middlesex

This paragraph has records from the City of London and a sequence of boroughs from Tower Hamlets to Kensington and Chelsea. The two following paragraphs deal with a group of boroughs in the north-west of the vice-county and another in the west. Prof. Edgington's paper about wall ferns in the City and elsewhere in inner London appears on page 51 of this issue. On the platform of Barbican Station I found several plants of wall lettuce *Mycelis muralis*; this native plant of the outer parts of our area is increasingly colonizing urban habitats. In Tower Hamlets Prof. Edgington found lesser sunflower *Helianthus petiolaris* established and possibly spreading on waste ground by Lochnagar Road, Bromley, and on the strand line by Amsterdam Road on the Isle of Dogs a *Chenopodium* which from his description I would think is most likely to be Probst's goosefoot *C. probstii*. In Manchester Road, also on the Isle of Dogs, John Swindells found *Stellaria pallida*, another species which appears to have increased in our area. Figure 3 shows it as recorded in 38 tetrads in our area in 1990–2000, compared to 24 in 1965–76 (Burton 1983: 34). Prof. Edgington also went to localities in Hackney; the record of *Lepidium latifolium* by the canal near Springfield Park is his, but his records from Abney Park Cemetery do not include the recent arrival there, a large patch of valerian *Valeriana officinalis* which I learned about from Brian Wurzell. In Springfield Park Mr Wurzell reports a plant of polypody *Polypodium vulgare* and on a drystone wall established fairy foxglove *Erinus alpinus*, *Gypsophila repens* L. and a seedling of *Euphorbia myrsinites* L. 'from nowhere'. From Islington, Mr Wurzell reports large bird's-foot trefoil *Lotus pedunculatus* as an unlikely weed in a barrel outside a pub in Hemingford Road, Barnsbury planted up with petunias. Aaron Woods is a new member of this Society and his cluster of plants of garden rocket *Eruca vesicaria* in Whitecross Street is probably a new species for the borough. His records from Camden include *Bidens ferulifolia*, spear-leaved willowherb *Epilobium lanceolatum*, spineless saltwort *Salsola kali* subsp. *ruthenica* and French marigold *Tagetes patula* as casuals on streets of Camden Town. Richard Fitter's *Bidens ferulifolia* came from the foot of a wall off Rosslyn Hill. Prof. Edgington sent me a photograph and specimen of a low, bushy *Antirrhinum* from a pavement in Doughty Street; it is impossible to give a botanical name to such a plant. John Archer's unusual casual was a specimen of annual beard-grass *Polypogon monspeliensis* from the flat shingled roof of the Camden Town building which the London Ecology Unit has recently left. Of the very many records from Hampstead Heath, I should single out the unaccountable plant sea fern-grass *Catapodium marinum* found by Barbara Villiers and the two groups of several plants of perfoliate alexanders *Smyrnium perfoliatum* near the Bird Sanctuary found by Sheila Eyres. Anthony Vaughan supplemented his long list of very detailed records from the Heath with some notes of plants which had appeared as a result of sowing on ground disturbed by the burial of a gas pipe in 1992. With Roy Maycock, Mr Woods found self-sown *Bidens ferulifolia* in several places in the London Zoo, and also in Regent's Park in the City of Westminster self-sown French meadow-rue *Thalictrum aquilegifolium* and Argentinian vervain *Verbena bonariensis* in Queen Mary's Gardens.

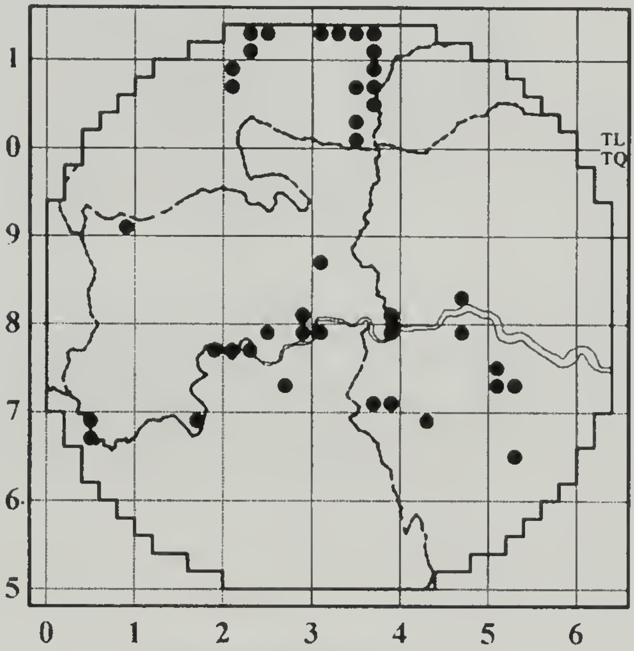

FIGURE 3. Tetrad records of *Stellaria pallida,* 1990–2000.

From Haringey, Prof. Edgington sent me some interesting records, including chives *Allium schoenoprasum* naturalized and spreading by an abandoned railway at Crouch End. On the shingle bordering Lockwood Reservoir he found a few plants of the distinctive normally coastal var. *marinum* Bab. of bittersweet *Solanum dulcamara*; boundary changes have transferred this locality to Waltham Forest. David Bevan told me of Meg Game's discovery of a plant of hard fern in Queen's Wood. Mr Wurzell sent me a number of records from the neighbourhood of Sandhurst Road, Ponders End in Enfield, including river water-dropwort *Oenanthe fluviatilis* at intervals in the adjacent brook, a single large plant of hound's-tongue *Cynoglossum officinale* in a grassy open place, a casual plant of lesser calamint *Clinopodium calamintha* descended from a plant given by him to the owner of the garden on the other side of the fence, self-sown seedlings of *Dorycnium hirsutum* (L.) Ser. from a large planted shrub, and escaped sweet cicely *Myrrhis odorata* in three places, seldom allowed to flower. As Mr Blades's hairy finger-grass *Digitaria sanguinalis* was spread over about ten metres of pavement cracks of The Mall, Southgate, it was presumably not all a first-generation casual. I must preface my records from Barnet with an apology for my error, repeated here over a few years, which placed the Hampstead Heath Extension in Brent. In a hedgebank towards the north end of the Extension, Mr Vaughan found a little wood millet *Milium effusum*, probably a relictual native in this locality. Diana Griffith's records include marsh ragwort *Senecio aquaticus* from Highwood Hill and several casuals from an area of reclaimed spoil-heap near Whetstone Station, including golden dock *Rumex maritimus*, confirmed for her by Dr John Akeroyd.

I have a few 1999 records from Ealing. Neil Anderson told me of hoary plantain *Plantago media* established for at least twenty years on the lawn of his parents' house in Acton. Peter Edwards told me of four plants of greater burnet-saxifrage *Pimpinella major* just west of Horsendon Lane, and rustyback *Ceterach officinarum* with five other ferns on the damp wall of a half-derelict factory near Hanwell High Street. The only record this year from the v.c. 21 part of Richmond-upon-Thames is Dr Bartlett's stinking tutsan *Hypericum hircinum* scattered on the river wall below Hampton Court, an extension of a known colony on the Surrey shore upstream. Colin Bowlt supplied a few excellent records from the Ruislip area in Hillingdon, including heath milkwort *Polygala serpyllifolia* from four places in Grub Ground east of Park Wood and a splendid flowering clump of lousewort *Pedicularis sylvatica* on Ruislip Common. Bill and Carol Hawkins produced a long list of plants from a new dumping ground near the canal at Yiewsley, which helps to explain the very high total of plants recorded for *Atlas 2000* from the hectad TQ08 (Dines 2000). It is very difficult to know what to select from the list, but I will mention the six plants of hyacinth *Hyacinthus orientalis*, the metre-high sapling of European silver-fir *Abies alba* and white mullein *Verbascum lychnitis*.

There are also some records from that part of v.c. 21 which is in the present boundaries of Surrey. Our meeting of 8 May was on the right date to examine the populations of adder's-tongue *Ophioglossum vulgatum* and upright chickweed *Moenchia erecta* on Staines Moor. In another place near Staines on that day Andy Johnson found whorl-grass *Catabrosa aquatica*, which was later confirmed by Mr Hounsome. In the town Mr Phillips found an abundance of *Conyza bilbaoana*, a new record for the vice-county.

V.C. 24, Bucks.

David Rear found opposite-leaved golden-saxifrage *Chrysosplenium oppositifolium* in Caps Wood, near Denham, a new locality for this uncommon species.

Acknowledgements

As well as the many people who have sent me records, I must acknowledge technical help from my son Geoff Burton. The maps were produced using Dr Alan Morton's programme Dmap, taking records from a Microsoft Access database.

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Obituary

MARGARET ELIZABETH KENNEDY, 1919–1999

With the death of Margaret Kennedy on 24 July 1999, the London Natural History Society has lost one of its most loyal and hard-working honorary vice-presidents. Margaret joined the LNHS in 1945 and soon began to play a part in its organization. The first printed evidence for this is in *The London Naturalist* for 1949 where she appears as joint minuting secretary of general meetings, a post she held individually from the following year until 1991. At much the same time she was serving on the Ecology Section committee from 1953 until 1994 in various capacities, notably as secretary and as programme secretary, whilst in 1960 she joined the Botany Section committee until 1980. Margaret was Section secretary from 1965 to 1975, covering almost all the busy period when the recording for the *Flora of the London Area* was being organized and carried out. Most of the records in the *Flora* from the northern quarter or more of the area are hers, often with Duggie Kent, Ted Bangerter or Peter Holland as a passenger in her car, so that she did not have to claim sole responsibility for any of them.

It is not clear when Margaret took on the role of Committee Rooms Booking Secretary, but it was from at least 1969 and she only handed this post over a few months before her health began to fail in early 1999. Council recognized the Society's indebtedness to her by appointing her an honorary vice-president in 1991. For several years spanning the 1980s to 1990s she was secretary to *The London Naturalist* committee.

Margaret was born on the 14 November 1919 and spent her childhood in Stoke Newington. From 1938 to 1940 she attended the Bishop Otter College, Chichester, where she obtained her teaching diploma, gaining distinctions in music and religious knowledge. On her return to London, she taught in local primary schools until, in 1954, she took up a post at the Lancastrian Junior School, Tottenham, with special responsibility for the girls in the school and the teaching of needlework. The classes at that time were large, with forty or more pupils, but they had the advantage of proximity to Bruce Castle Park, where the children could go to play games and study nature at first hand. She remained at this school until her retirement as deputy head in 1980.

Margaret was always keenly interested in local affairs, being a member of her local Baptist church, where she played piano and organ, helped at coffee mornings and with the distribution of flowers after services to old folks and others in the borough. She was always ready to step in to play for other nearby churches when their regular organists were not available. She loved driving and I well remember when she changed her 'Mini' for a four-door car, in order the more easily to take elderly or handicapped patients for their hospital appointments as part of the local 'Meet-a-need' service which she supported most keenly. Her readiness to drive around London served the LNHS in good stead, and on one occasion she had to make a double trip of about thirty miles of rural Hertfordshire when hers was the only car to take seven members back to a railway station. Margaret was chair of a local ladies' guild and a member of the Women's World Day of Prayer committee.

A funeral and service of thanksgiving for Margaret's life were held at the Enfield Baptist church on 5 August 1999. The Society was represented and the members attending showed how respected and loved she had been, both locally and more widely throughout the land. It had been suggested that donations might be made to the RSPB in lieu of flowers and the impressive response to this was greatly appreciated by that Society. There will be an entry in their Book of Remembrance at Minsmere, Suffolk as a lasting memorial to her.

PETER HOLLAND

Book review

Barevný atlas housenek Střední Evropy: Noční motyli (The colour guide to caterpillars of Central Europe: moths). Jan Macek and Václav Cervenka. Published by the authors. 1999. xv plus 84 pp., 37 colour plates with 296 photographs, bilingual text (English and Czech). 240 × 170 mm., hardbound, ISBN 80 238 3768 0. Sole distributors – Apollo Books, Kirkeby Sand 19, DK-5771 Stenstrup, Denmark. 280 Danish Krone plus postage.

Close on the heels of Jim Porter's *Colour identification guide to caterpillars of the British Isles* (Viking, 1997) comes this latest contribution to the identification of macrolepidoptera larvae. The English version of the Preface states that ' . . . this publication will be issued as a series of volumes, each of which will list only the species not dealt with in the preceding volumes. Each volume should cover 250–300 species . . .' It is odd that this Preface occupies only half the space of the Czech equivalent; even with my very limited knowledge of Czech I can see a number of discrepancies — including the publication date of Porter's book, which is given as 1998 in the Czech text and 1997 in the English version, and which makes me wonder if the first three paragraphs in particular have been summarized).

The format is very broadly similar to that in Jim's book, with a separate text section first, followed by a colour plate section in which several separate photographs are reproduced on each page. Indeed, the authors express the desire that the two works should be complementary (somewhat unfortunately translated as a desire that this book should be a 'supplement' to Porter's). The photographs are somewhat larger than those in the British book measuring 45 mm tall by 65 mm wide (in 'Porter' they are 34 × 52 mm), but this slightly improved image, which I rather like, has, perhaps, been achieved at the expense of the omission of many species. The families covered number nine (though both versions of the Preface list only eight) and these are, in order of presentation, Lasiocampidae, Saturniidae, Lemoniidae, Sphingidae, Notodontidae, Noctuidae, Pantheidae, Lymantriidae and Arctiidae; representing these nine families are only 260 (authors' figure) species. Perhaps those included were selected to show more of the range of forms than to provide a comprehensive identification guide, or perhaps choice was based upon availability, but either way I would have preferred to have a volume that dealt with a taxonomically coherent section in a more comprehensive manner. Missing species may well soon be covered in subsequent volumes, but is this not likely to give me a problem of locating a particular species?

A key to families (and some genera) of species is presented and the text section has sub-headings which include Range, Flight period, Larval period, Food plant, Habitat, and Biology. Identification appears to rely totally on matching beast with picture; the brief but helpful descriptive text to be found in Porter's book is absent from the present work. This I find worrying, simply because I know from personal experience that, very often, having spotted the apparently correct picture, reference to key diagnostic features in the text has made me search the plates again! On the other hand, three of the 'Extinct and irregular immigrant species' that were not figured in Porter's book are figured here — *Lithophane lamda* Fabr., *Acronicta auricoma* D.& S. and *Periphanes delphinii* L. — along with several non-British species, some of which, conceivably, could perhaps turn up here over if climate warming takes place. Too much comparison with the existing British tome is both unwise and unfair, of course, but this book is far more likely to appeal to the ever-growing band of lepidopterists who, like the reviewer, study or collect moths in Europe than it is to those who stay at home.

COLIN W. PLANT

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Papers should be submitted **in duplicate** to the editor, Mr K. H. Hyatt at his home address, 1 Tremcelynog, Rhandirmwyn, Llandovery, Carmarthenshire SA20 0NU, before the end of January if they are to be considered for publication in the same year. However, the editor may be contacted at any time on 01550 760346 to discuss possible contributions, and will be pleased to send a recent offprint to show our style, and as a guide to preparing the manuscript. Manuscripts **must** be double spaced on one side of the paper only and with wide (3-cm) margins. Authors must retain a copy. Papers should include at the beginning an **abstract, summary** or **synopsis. Sheets must be numbered.** The editor would be pleased to receive contributions as ASCII files on disc in IBM-compatible format as well as in manuscript as above. Papers should be relevant to the natural history and archaeology of the London Area. This includes comparisons between London and its surrounding countryside with other localities, as well as work relating to or comparing species or habitats which occur in the London Area.

Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and **only** Latin names of genera and species must be underlined unless typed in italic. When both common and Latin names are given there should be no brackets or commas separating them. **Genus names should appear in full where first used within each paragraph.** When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers up to 100 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year, i.e., 25 December 1971, but in lists may be as 25.xii.1971. Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs, or St. Lists should be in systematic, alphabetic or numerical order. **Hyphens should not appear at the end of lines** as the right-hand margins of manuscripts do not need to be justified: **turn off the hyphenation option. Tables and figure legends should be typed on separate sheets at the end of the text. Word-processed text should not use italic, bold or compressed typeface. Paragraphs should be indented. Sentences must not begin with numerals.**

References

Reference citation should be based on the Madison rules (*Bull. Torrey bot. Club* **22:** 130–132 (1895)), except that a colon should always precede a page number. Capitalization in titles of books and papers in journals should be kept to a minimum. Journal titles should be in full, or follow the abbreviations in the *World list of scientific periodicals,* and be underlined or in italics. Book titles should also be underlined or in italics.

Examples are as follows:

In text:

Meadows (1970:80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964–9. *Lond. Nat.* **49:** 76–81.

MELLANBY, K. 1970. *Pesticides and pollution.* Ed.2. Collins, London.

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